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Protein and Lysine Levels in Growing-Finishing Swine Rations

R. C. Wahlstrom, G. W. Libal and J. F. Fredrikson

Although we speak in terms of protein content of the ration, swine actually require amino acids, not protein, for optimum performance. Thus, a ration containing 14% protein could be composed of ingredients that would give it an amino acid content equal to another ration containing 16% protein.

Cereal grains are particularly low in lysine, one of the essential amino acids, and a protein supplement must be fed with grains to supply additional lysine as well as other amino acids. The purpose of the experiment reported herein was to study the performance of growing and finishing pigs when fed rations of different protein content with and without additional lysine supplementation.

Experimental Procedure

One hundred twenty weanling pigs were divided into three replicate groups on the basis of weight and sex. Each replicate was then allotted into five treatment groups of 8 pigs each with equal numbers of gilts and barrows. Thus, three lots of pigs received each of the ration treatments which were:

1. 16% protein ration (high protein)
2. 14% protein ration (medium protein)
3. 14% protein ration plus 0.15% L-lysine
4. 12% protein ration (low protein)
5. 12% protein ration plus 0.15% L-lysine

The lysine supplementation increased the lysine content of those rations to a level equivalent to that in the rations containing 2% additional protein. All rations were decreased 2% in protein content when the pigs weighed approximately 110 lb. Composition of the rations is shown in table 1.

Average initial weights of pigs in the three replicates varied from approximately 30 to 47 lb. with treatment averages of the three replicates being about 39 lb. The pigs were weighed off of the experiment when they reached an average weight of from 200 to 210 lb. except for five pigs in treatment 4 and two pigs in treatment 5 that had not reached 200 lb. when the experiment was terminated.

Carcass data were obtained after the carcasses had been cooled for approximately 24 hours. Data collected were carcass length, backfat, percent ham and loin and area of the loin eye muscle.

Results

Growth performance data are summarized in table 2 and carcass data in table 3. Pigs in treatment 1 (high protein ration) and those on treatments 2 and 3 (medium protein ration without and with lysine, respectively) had identical average daily gains (1.54 lb. per day). The low protein ration, treatment 4, was clearly deficient in protein as the pigs had an average daily gain of only 1.16 lb. per day.

Pigs fed the low protein ration plus lysine, treatment 5, gained 1.35 lb. per day which was 0.19 lb. per day faster than those pigs fed this ration without lysine but was 0.19 lb. per day slower than those pigs fed the medium protein ration with the same lysine content (treatment 2). This would indicate that the low protein ration was deficient in lysine content and also in some other amino acid(s).

Feed required per pound of gain was somewhat variable between treatments although the low protein ration, treatment 4, required considerably more feed per unit of gain. Feed:gain ratios were 3.46, 3.56, 3.31, 4.03 and 3.57 for treatments 1, 2, 3, 4 and 5, respectively.

Carcasses of pigs fed the high protein ration or the medium protein rations did not differ in the characteristics measured. Carcasses of pigs fed the low protein ration without supplemental lysine had slightly more backfat, almost one square inch less loin eye area and about 1% less ham and loin. Loin eye area and ham-loin percentage of carcasses from pigs fed the low protein ration plus lysine were somewhat greater than those fed this ration without lysine but smaller than those from pigs fed the medium or high protein ration.

Summary

Pigs fed low protein rations, 12% to 110 lb. and 10% from 110 lb. to market weight, gained slower, required more feed per unit of gain and produced carcasses with smaller loin eye areas and less percentage of ham and loin. Supplementing this low protein ration with lysine improved gain, feed:gain ratio and carcass characteristics, but performance did not equal that of pigs fed higher protein rations.

Table 1. Composition of Rations (Percent)

	To 110 lb.			110 lb. to market		
	16	14	12	14	12	10
Ground yellow corn	76.0	82.0	87.5	82.5	88.0	93.2
Soybean meal, 44%	21.0	15.0	9.4	15.0	9.4	4.0
Dicalcium phosphate	1.7	1.8	1.9	1.3	1.4	1.5
Ground limestone	0.5	0.5	0.5	0.5	0.5	0.5
Trace mineral salt	0.5	0.5	0.5	0.5	0.5	0.5
Vitamin-antibiotic premix ^a	0.25	0.25	0.25	0.25	0.25	0.25

^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 lb. of ration.

Table 2. Growth Performance of Pigs Fed High, Medium and Low Protein Rations, With and Without Lysine

	High protein (16-14%)	Medium protein (14-12%)	Medium protein +0.15% lysine	Low protein (12-10%)	Low protein +0.15% lysine
No. of pigs ^a	24	23	24	24	24
Avg. initial wt., lb. ^b	38.6	39.1	38.5	38.2	38.9
Avg. final wt., lb.	202.7	201.6	204.1	183.4	198.7
Avg. daily gain, lb.	1.54	1.54	1.54	1.16	1.35
Avg. feed cons./day, lb.	5.34	5.49	5.09	4.67	4.84
Feed:gain ratio	3.46	3.56	3.31	4.03	3.57

^a Three replicates of 8 pigs each per treatment. One pig died on medium protein.

^b Average initial weights were 47.3, 39.2 and 29.3 lb. for replicates 1, 2 and 3, respectively.

Table 3. Carcass Data of Pigs Fed High, Medium and Low Protein Rations, With and Without Lysine

	High protein (16-14%)	Medium protein (14-12%)	Medium protein +0.15% lysine	Low protein (12-10%)	Low protein +0.15% lysine
No. of carcasses	24	23	24	19	22
Cold carcass wt., lb.	146.7	145.8	148.0	138.3	144.8
Avg. carcass length, in.	30.2	30.2	30.4	30.0	30.8
Avg. carcass backfat, in.	1.35	1.37	1.34	1.42	1.37
Avg. ham-loin, %	38.1	38.0	38.0	37.1	37.4
Avg. loin eye area, sq. in.	3.8	3.7	3.9	2.9	3.4