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Most recommendations state that weaned pigs should receive a diet containing 16% protein from a weight of about 40 to 75 pounds. Feeding a diet containing less protein may result in somewhat poorer performance because of a lack of sufficient lysine. During the finishing period, from 110 lb. to market weight, diets should contain at least 12% protein to support maximum rate of gain, feed efficiency and lean muscle development.

The objectives of this experiment were to obtain additional information on the effects of supplementary lysine in swine growing diets of 12 or 14% protein and finishing diets of 10 or 12% protein on daily gains, feed efficiency and carcass development.

Experimental Procedure

Seventy-two crossbred pigs, averaging about 39 lb. initially, were allotted to three replications of six treatments on the basis of ancestry, sex and weight. Each lot contained four pigs consisting of equal numbers of barrows and gilts in replicates 1 and 3 and three barrows and one gilt in replicate 2. The pigs were housed in uninsulated, wood frame houses with concrete floors and connecting concrete lots where self-feeders and waterers were located.

The experimental treatments were as follows:

1. 16% protein diet to 110 lb.; 14% protein diet, 110 to 207 lb.
2. 14% protein diet to 110 lb.; 12% protein diet, 110 to 207 lb.
3. Diet 2 plus 0.15% L-lysine
4. 12% protein diet to 110 lb.; 10% protein diet, 110 to 207 lb.
5. Diet 4 plus 0.15% L-lysine
6. Diet 4 plus 0.30% L-lysine

The composition of the corn-soybean meal diets is shown in table 1. The pigs were removed from their respective treatments at individual weights of about 207 lb. and slaughtered at the University Meat Laboratory. Carcass data obtained were backfat thickness, carcass length, loin eye area, percent ham and loin and dressing percent.

Results

Daily gains, feed/gain and carcass data are summarized and presented in tables 2, 3 and 4, respectively. There were significant differences in average daily gain during all periods. Pigs fed the 16-14% protein sequence gained more rapidly than pigs fed the other diets during both the growing and finishing periods.

Supplementing the 14-12% protein diets with 0.15% lysine gave diets of equal lysine content to the higher protein diet, but gains were less than for pigs fed the 16-14% protein dietary sequence, particularly during the finishing period. There was no beneficial effect from adding lysine to the 14-12% diets. Pigs fed the 12% protein diet up to 110 lb. and the 10% diet after 110 lb. grew at a very suboptimal rate. Lysine supplementation did improve gains of pigs fed these diets, but 0.30% lysine supplementation was not superior to 0.15% added lysine. It is assumed that these diets were also lacking in tryptophan which was limiting growth below that of pigs fed an equal lysine level in the 14-12% protein diets.

Feed efficiency was also reduced when pigs were fed the low protein (12-10%) diets but was similar for pigs fed diets of 16-14, 14-12 or 14-12% protein plus lysine. Pigs fed the 12-10% protein diets plus 0.15 or 0.30% lysine required less feed/gain than pigs fed these low protein diets without lysine supplementation. However, feed/gain was still greater than that of pigs fed the medium and high protein diets.

The carcass data indicate the effect of protein on muscle development. Pigs fed the low protein diet had smaller loin eye areas and less percent ham and loin. Adding lysine to this diet resulted in an increased loin eye area and percent ham and loin. There were no large differences in carcass measurements of pigs fed the 16-14, 14-12 or 14-12% protein plus 0.15% lysine diets.

Summary

This experiment was designed to study dietary protein and lysine needs of growing and finishing swine. Pigs fed diets of 16% protein during the growing phase gained slightly faster than pigs fed 14% protein diets with or without lysine. However, feed/gain was similar among these treatments. Pigs fed a 12% diet during this period (39 to 110 lb.) gained significantly less than those fed the 16 or 14% protein diets. Supplementation of 0.15 and 0.30% lysine to the 12% diet resulted in gains and feed efficiencies intermediate between pigs fed the 12% and either 14 or 16% protein diets. Results during the finishing phase where diets of 14, 12 or 10% protein were fed were similar to those of the growing phase. The 10% diet was improved by supplemental lysine, but again performance was intermediate to that of pigs fed 12 or 14% protein diets. It is assumed that the low protein diets were also deficient in tryptophan which may have limited growth. The data indicate that a 14-12% dietary protein sequence during growing and finishing is only slightly less adequate than a 16-14% protein sequence, but that a 12-10% protein diet is too low even if supplementary lysine is added to the diet.

Table 1. Composition of Diets (Percent)

Ingredient	Percent protein			
	16	14	12	10
Ground yellow corn	77.0	82.7	88.4	93.9
Soybean meal (44%)	20.2	14.6	9.0	3.5
Dicalcium phosphate	1.6	1.5	1.4	1.4
Ground limestone	0.5	0.5	0.5	0.5
Trace mineral salt (0.8% zinc)	0.5	0.5	0.5	0.5
Vitamin-antibiotic[a]	0.2	0.2	0.2	0.2

[a] Provided per lb. of diet: vitamin A, 1500 IU; vitamin D, 200 IU; riboflavin, 1.25 mg; pantothenic acid, 5 mg; niacin, 10 mg; choline, 50 mg; vitamin B_{12}, 7.5 mcg and aureomycin, 10 milligrams.

Table 2. Effect of Protein Level and Lysine Supplementation on Daily Gain, Lb.[a]

Treatments[b]	39-110 lb.[c]	110-207 lb.[d]	39-207 lb.[d]
1. 16-14% protein	1.53	1.98	1.77
2. 14-12% protein	1.43	1.85	1.64
3. Diet 2 + 0.15% lysine	1.48	1.78	1.63
4. 12-10% protein	1.01	1.09	1.06
5. Diet 4 + 0.15% lysine	1.24	1.61	1.41
6. Diet 4 + 0.30% lysine	1.21	1.44	1.33

[a] Three replicates of 4 pigs each per treatment.
[b] Dietary protein changed at 110 pounds.
[c] Significant difference ($P<.025$).
[d] Significant difference ($P<.005$).

Table 3. Effect of Protein Level and Lysine Supplementation on Feed Per Gain

Treatments	39-110 lb.[a]	110-207 lb.[b]	39-207 lb.[b]
1. 16-14% protein	2.86	3.35	3.13
2. 14-12% protein	2.84	3.40	3.15
3. Diet 2 + 0.15% lysine	2.85	3.49	3.19
4. 12-10% protein	3.46	5.24	4.07
5. Diet 4 + 0.15% lysine	3.01	3.91	3.53
6. Diet 4 + 0.30% lysine	3.11	3.60	3.27

[a] Significant difference (P<.025).
[b] Significant difference (P<.005).

Table 4. Effect of Protein Level and Lysine Supplementation on Carcass Characteristics

Treatments	Dressing percent	Backfat in.	Length in.	Loin eye area sq. in.	Ham-loin percent[a]
1. 16-14% protein	70.0	1.34	30.0	4.36	40.9
2. 14-12% protein	71.5	1.39	29.9	4.35	39.5
3. Diet 2 + 0.15% lysine	71.2	1.30	29.0	4.41	39.9
4. 12-10% protein	69.9	1.40	29.3	3.76	38.0
5. Diet 4 + 0.15% lysine	70.3	1.40	30.1	4.05	38.9
6. Diet 4 + 0.30% lysine	70.3	1.34	30.0	4.22	39.3

[a] Significant difference (P<.05).