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EFFECT OF PROTEIN LEVEL, LYSINE AND OATS IN DIETS FOR GROWING-FINISHING PIGS

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Previous research has shown that the protein content of swine diets can be reduced approximately two percent if the diet is supplemented with lysine and if the diet is not deficient in other amino acids. Corn-soybean meal diets that are reduced more than two percent in protein may become deficient in the amino acid tryptophan. Oats contains more lysine and tryptophan but less energy than corn. However, dietary levels of 20 to 30% oats have generally not affected pig performance. The objectives of this experiment were to evaluate the protein and lysine needs of growing-finishing pigs and to determine the value of oats as an amino acid source in low protein diets containing 20% oats as a replacement for corn.

(Key Words: Pigs, Performance, Protein Level, Lysine Level, Oats, Tryptophan.)

Experimental Procedure

Two trials were conducted, trial 1 in July, August and September and trial 2 from September through November. In each trial, 48 crossbred barrows and 48 gilts were randomly allotted on the basis of weight and ancestry to four treatment groups. Three replicate pens of four barrows and three pens of four gilts received the following dietary treatments:

1. 16% protein, corn-soy diet, for 4 weeks, then changed to a 14% protein diet
2. 14% protein, corn-soy diet
3. 12% protein, corn-soy diet plus lysine (isolysine to diets in treatment 1)
4. Diet 3 with oats substituted for corn at level of 20% of the diet

Pigs were provided approximately 8 sq. ft. of pen space in a slotted floor, enclosed confinement building. Starting weights for the pigs in trial 1 averaged 92 lb and ranged from 80 to 106 lb for the three replications while in trial 2 the average initial weight was 51 lb with a range of 49 to 54 lb. The trials were terminated at final weights of approximately 220 lb. Composition of the diets is shown in table 1.

Table 1. Composition of Experimental Diets (%)

Item	16% CP Corn-soy	14% CP Corn-soy	12% CP Corn-soy	.12% CP 20% oats
Corn	76.77	82.47	87.68	67.68
Oats				20.0
Soybean meal, 44%	20.7	15.0	9.3	9.3
Dicalcium phosphate	1.2	1.2	1.3	1.3
Limestone	.9	.9	.9	.9
Salt, white	.3	.3	.3	.3
Premix[a]	.13	.13	.13	.13
L-lysine HCl[b]			.39	.39

a Provided trace minerals, vitamins and antibiotic.

b Reduced to .2% after first 4 week, corn adjusted accordingly.

Results and Discussion

The performance data for pigs in trial 1 are summarized in table 2. During the 28 day grower period, gilts receiving the 12% protein, lysine supplemented diet or the 20% oats diet gained slower than gilts fed the 16 or 14% protein diets. The slower gains of these two groups resulted in barrows gaining significantly faster ($P<.05$) than gilts. Barrows also consumed more ($P<.05$) daily feed but were less ($P<.01$) efficient than gilts. Barrows fed the 16 or 14% protein diets were more efficient ($P<.05$) than barrows fed the 20% oat diet. There were no significant differences among treatments during the finishing period, however, the barrows gained 10% faster (1.77 vs. 1.61 lb/day) than gilts. Likewise, there were no statistical differences in performance during the overall period. Barrows consumed 9.7% more feed while gaining about 8% faster than gilts.

The results of the second trial are shown in table 3. For the first 28 day period, average daily gain was highest for barrows and gilts fed the 16% protein diet. Pigs fed the 14% protein diet and the 20% oat diet gained similarly but faster than those fed 12% protein. Pigs fed the 16% protein diet during this period were also more efficient ($P<.005$) than pigs receiving the other three diets. Pigs fed the 12% protein diet with supplemental lysine gained slower and consumed less feed daily during the finishing period and the overall period than pigs receiving the other treatments. Weights at the beginning of the finisher period averaged 90 to 100 lb. Barrows also consumed more feed and gained faster than gilts during the finishing and overall periods.

The difference in the results of the two trials may have been due to the difference in the initial weights of pigs. The lighter pigs require a higher protein diet and thus performance was affected more in trial 2 when the lower protein diets were fed. The poorer performance of pigs fed the 12% protein diet supplemented with lysine (trial 2) compared to pigs fed this diet with 20% oats substituted for corn, suggest that the 12% diet may have been deficient in tryptophan. Oats is a good source of tryptophan and by chemical analysis this diet contained .12% tryptophan while the 12% protein corn-soy diet contained only .10% tryptophan.

Summary

One hundred ninety-two crossbred pigs averaging 92 lb (trial 1) and 51 lb (trial 2) were used to study the effect of protein and lysine levels and oats in diets for growing-finishing pigs. Dietary treatments were: (1) 16% protein for 28 days then 14%; (2) 14% protein; (3) 12% protein plus lysine to equal levels in treatment 1 and (4) diet 3 with 20% oats replacing corn.

Performance of barrows averaging 92 lbs initially did not differ among treatments during any of the periods. However, during the initial 28 day period, gilts fed the 16 or 14% protein diets gained faster than those fed the 12% protein diets. Pigs with an initial weight of 51 lb. fed a 16% protein diet gained faster and more efficiently during the initial 28 day period than pigs fed all other treatments. For the finisher and overall period, performance was similar for pigs fed the 16-14, 14 and 12% protein diet containing 20% oats and average daily gain and daily feed were greater for these pigs than pigs fed the 12% protein, lysine supplemented diet.

Table 2. Performance of Pigs by Periods, Trial 1[a]

Treatment[b]	Barrows 1	2	3	4	Gilts 1	2	3	4
Grower (28 days)								
ADG, lb[c]	1.78	1.76	1.76	1.72	1.76	1.77[d]	1.60[e]	1.56[e]
ADF, lb[c]	5.24	5.33	5.53	5.70	4.99[e]	5.27[d]	4.90[e]	4.59[e]
F/G[f]	2.95[d]	3.02[d]	3.13[d,c]	3.33[c]	2.83	2.96	3.06	2.94
Finisher								
ADG, lb	1.81	1.76	1.78	1.74	1.54	1.67	1.59	1.63
ADF, lb	6.85	6.74	6.70	7.12	6.22	6.29	6.18	6.19
F/G	3.80	3.83	3.77	4.12	4.03	3.75	3.89	3.79
Overall								
ADG, lb	1.79	1.76	1.78	1.73	1.62	1.71	1.59	1.60
ADF, lb	6.25	6.23	6.28	6.61	5.80	5.93	5.75	5.65
F/G	3.49	3.55	3.54	3.84	3.58	3.46	3.62	3.52

[a] Each value is an avg of 3 reps of 4 pigs each, avg initial wt, 92 lb.

[b] Protein, % of diets was 16-14, 14, 12 + Lysine and 12 (20% oats) for treatments 1, 2, 3 and 4, respectively.

[c] Barrows differ from gilts ($P<.05$).

[d,e] Means without a common superscript differ ($P<.05$).

[f] Barrows differ from gilts ($P<.01$).

Table 3. Performance of Pigs by Periods, Trial 2[a]

Treatment[b]	Barrows 1	2	3	4	Gilts 1	2	3	4
Grower (28 days)								
ADG, lb[c]	1.74	1.69	1.40	1.58	1.70	1.54	1.44	1.58
ADF, lb	4.52	5.05	4.16	4.92	4.68	4.50	4.46	4.65
F/G[d]	2.60	2.99	2.97	3.12	2.76	2.92	3.10	2.93
Finisher								
ADG, lb[e]	1.88	1.97	1.75	1.93	1.81	1.70	1.57	1.75
ADF, lb[f]	7.45	7.63	6.40	7.41	6.37	6.12	5.82	6.21
F/G	3.95	3.87	3.66	3.85	3.52	3.59	3.71	3.56
Overall								
ADG, lb[g]	1.81	1.83	1.58	1.75	1.76	1.62	1.50	1.67
ADF, lb[g]	6.05	6.33	5.31	6.16	5.57	5.35	5.16	5.47
F/G	3.33	3.46	3.36	3.52	3.17	3.30	3.44	3.28

[a] Each value is an avg of 3 reps of 4 pigs each, avg initial wt, 51 lb.

[b] Protein, % of diets was 16-14, 14, 12 + Lysine and 12 (20% oats) for treatments 1, 2, 3 and 4, respectively.

[c] Orthogonal comparisons of treatments (barrow and gilts combined) 16-14 differs from 14 ($P<.05$) from 12-Ly ($P<.005$) from 12-oats ($P<.01$); 14 and 12-oats differ from 12-Ly ($P<.005$).

[d] 16-14 differs from all treatments ($P<.005$).

[e] Barrows differ from gilts ($P<.005$); 16-14, 14 and 12-oats differ from 12-Ly ($P<.005$).

[f] Barrows differ from gilts ($P<.005$); 12-Ly differs from 16-14 and 14 ($P<.01$) and 12-oats ($P<.025$).

[g] Barrows differ from gilts ($P<.005$); 16-14, 14 and 12-oats differ from 12-Ly ($P<.005$).