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High-Lysine Corn in Growing Pig Rations

Richard C. Wahlstrom and George W. Libal

In 1935 workers at the Connecticut Agricultural Experiment Station discovered a mutant gene in corn called Opaque-2. Yet high-lysine corn, the product of this discovery, was not identified until 1963 at Purdue University. Since that time several experiments have been conducted on the value of the product in both human and animal nutrition. Also, considerable research is under way on the production aspects of high-lysine corn.

Regular corn is deficient in two of the essential amino acids needed by swine--lysine and tryptophan. High-lysine corn is also higher in tryptophan than normal corn. In certain other amino acids high-lysine corn may be higher or lower than normal corn. This experiment was conducted to study the value of high-lysine corn in rations for young growing pigs when the protein requirements are more critical than later in the growing period.

Experimental Procedure

Seventy-five pigs averaging about 22 lb. were divided into 15 lots on the basis of sex, weight and ancestry. Three lots were then randomly assigned to each of five treatments which were as follows:

1. 15% protein regular corn ration
2. 15% protein regular corn ration + 0.26% L-lysine
3. 15% protein high-lysine corn ration
4. 16.5% protein high-lysine corn ration
5. 18.7% protein regular corn ration

The composition of the rations fed is shown in table 1. Feed and water were provided ad libitum. Waterers were located in the house while feeders were in connecting outside pens. The protein and amino acid contents of the regular and high-lysine corn are shown in table 2. These analyses were conducted by the Station Biochemistry Department, South Dakota Agricultural Experiment Station. The high-lysine corn was supplied by the Trojan Seed Company, Olivia, Minnesota. Because of a limited supply of high-lysine corn, the experiment was terminated after 54 days.

Results

The growth performance data are summarized in table 3. Pigs receiving the 15% protein regular corn ration gained at the slowest rate. This would be expected since this ration contained only 0.64% lysine which is below the recommended level for pigs of this weight. Supplementing this ration with 0.26% lysine (total lysine 0.90%) or using high-lysine corn in a 15% protein ration resulted in a 10 to 13% increase in average daily gain and a 9 to 10% improvement in feed efficiency.

The 16.5% protein high-lysine corn ration was equal in lysine content to the 18.7% protein regular corn ration. Pig performance on these two rations was similar and slightly better than that of pigs fed the 15% protein high-lysine or regular corn plus lysine rations. Pigs fed the high-lysine corn ration containing 16.5% protein gained 1.40 lb. per day and required 2.38 lb. of feed per lb. of gain while those on the 18.7% regular corn rations gained 1.35 lb. per day with a feed conversion of 2.36.

It is apparent from this and other research that high-lysine corn will support optimum pig performance at a lower protein level than when regular corn is fed. It is also possible that the improved gains on high-lysine corn rations compared to regular corn rations could be due to increased levels of other essential amino acids besides lysine. An inspection of table 2 will indicate that differences do exist in levels of several of the amino acids. High-lysine corn is not necessarily higher in protein content than regular corn. The corn used in this experiment was quite similar; high-lysine corn analyzed 10.12% protein and the regular corn had 10.03% protein.

Summary

Pigs weighing about 22 lb. initially gained 0.15 lb. per day faster and required 27 lb. less feed per hundred weight of gain when fed a 15% protein high-lysine corn ration compared to those fed a 15% protein regular corn ration. Supplementing the regular corn ration with 0.26% lysine improved performance to a level similar to those fed the 15% protein high-lysine ration. Additional improvement in gains and feed conversion, though not significant, were obtained when 16.5% protein high-lysine corn or 18.7% protein regular corn rations were fed.

Table 1. Composition of Rations (Percent)

Ration	A	B	C	D	E
Normal corn	83.3	83.3	--	--	73.8
High-lysine corn	--	--	83.3	79.5	--
Soybean meal (48.5%)	13.8	13.8	13.8	17.6	23.4
Dicalcium phosphate	1.7	1.7	1.7	1.7	1.6
Ground limestone	0.6	0.6	0.6	0.6	0.6
Trace mineral salt	0.5	0.5	0.5	0.5	0.5
Vitamin-antibiotic mix ^a	0.1	0.1	0.1	0.1	0.1
L-lysine	--	0.26	--	--	--
Calculated protein content	15.0	15.0	15.0	16.5	18.7
Calculated lysine content	0.64	0.90	0.80	0.90	0.90

^a Provided 1125 I.U. vitamin A, 340 I.U. vitamin D, 2 mg. riboflavin, 4 mg. calcium pantothenate, 9 mg. niacin, 10 mg. choline chloride, 10 mcg. vitamin B₁₂ and 10 mg. chlortetracycline per lb.

Table 2. Amino Acid Content of High Lysine and Normal Corn (Percent)

	High Lysine	Normal
Lysine	0.46	0.27
Histidine	0.32	0.27
Arginine	0.70	0.44
Threonine	0.31	0.20
Valine	0.56	0.52
Methionine	0.18	0.22
Cystine	0.15	0.16
Isoleucine	0.34	0.30
Leucine	0.85	1.07
Phenylalanine	0.44	0.43
Aspartic acid	0.98	0.52
Serine	0.48	0.44
Glutamic acid	1.66	1.60
Proline	1.36	0.75
Glycine	0.39	0.33
Alanine	0.62	0.58
Tyrosine	0.35	0.35
Protein	10.12	10.03

Table 3. Results of Feeding High-Lysine Corn to Young Growing Pigs

	Regular Corn	Regular Corn + Lysine	High- Lysine Corn	High- Lysine Corn	Regular Corn
Protein, %	15	15	15	16.5	18.7
Lysine, %	0.64	0.90	0.80	0.90	0.90
No. of pigs ^a	15	14 ^b	15	15	15
Init. wt., lb.	22.6	22.6	22.2	22.2	22.3
Final wt., lb.	85.1	91.7	92.9	97.9	95.3
Av. daily gain, lb.	1.16	1.28	1.31	1.40	1.35
Av. daily feed, lb.	3.13	3.17	3.19	3.33	3.19
Av. feed per lb. gain, lb.	2.70	2.49	2.43	2.38	2.36

^a Three lots of 5 pigs each per treatment.

^b One pig died, data not included.