1973

Amino Acid Supplementation of Opaque-2 Corn for Growing Pigs

Reid V. Merrill
South Dakota State University

Richard C. Wahlstrom

George W. Libal

South Dakota State University
Brookings, South Dakota
Department of Animal Science
Agricultural Experiment Station

A.S. Series 73-40

Amino Acid Supplementation of Opaque-2 Corn for Growing Pigs

Reid V. Merrill, Richard C. Wahlstrom and George W. Libal

Ten amino acids are required in the diet of the pig. Opaque-2 corn contains higher amounts of two of these essential amino acids, lysine and tryptophan, than normal corn. Research has shown that opaque-2 corn is generally superior to normal corn in promoting gains in growing pigs. Data also suggest that pigs require less supplemental protein when fed diets containing opaque-2 corn rather than normal corn.

The purpose of this research was to study the adequacy of the essential amino acids lysine, methionine, tryptophan, threonine and isoleucine in opaque-2 corn diets for young pigs. Rate of gain, feed efficiency and plasma amino acid levels were criteria used to evaluate the diets.

Experimental Procedure

Eighty-four crossbred pigs averaging approximately 28 lb. were divided into 21 lots of four pigs each. Each lot contained two barrows and two gilts. Three replicate lots received each of the following dietary treatments:

1. Opaque-2 corn
2. Treatment 1 + 0.4% L-lysine
3. Treatment 2 + 0.25% DL-methionine
4. Treatment 3 + 0.05% DL-tryptophan
5. Treatment 4 + 0.15% DL-threonine
6. Treatment 5 + 0.15% DL-isoleucine
7. 18% protein normal corn-soybean meal diet.

All diets contained supplemental vitamins and minerals at levels recommended by the National Research Council. Pigs were weighed weekly and feed was weighed back at 2-week intervals. Blood samples were obtained at the end of the 5-week feeding period for determination of amino acid levels.

Results

Growth performance data are summarized in table 2. Treatment means for average daily gain were 0.73, 0.86, 0.92, 1.01, 1.17, 1.19 and 1.28 lb. for diets 1 through 7, respectively. The increasing growth rates from diets 1 to 7 would indicate that amino acids as added were limiting and therefore diets were better balanced and higher in amino acid content. Diet 7 was calculated to be a fully adequate normal diet.

Treatments did not significantly (P<.05) affect feed consumption, although there was a noticeable difference in consumption between the pigs fed diets 1, 2 and 3 and those fed diets 4, 5 and 6. The latter three diets were supplemented with tryptophan. Average daily feed consumptions were 2.84, 2.88, 2.97, 3.32, 3.23, 3.37 and 3.17 for diets 1 through 7, respectively.

Feed efficiency was significantly (P<.05) affected by treatment. Required units of feed per unit of gain were 3.92, 3.35, 3.21, 3.28, 2.76, 2.85 and 2.48 for diets 1 through 7, respectively. Largest improvements in feed efficiency were noted with lysine and threonine supplementations.

The average daily gain and feed efficiency data indicate that opaque-2 corn was not improved by isoleucine supplementation. Since the pigs fed the corn-soybean meal diet gained at a faster and more efficient rate than those fed the opaque-2 corn supplemented with five amino acids, it is possible that either some other amino acid was deficient or that the levels of amino acids used in this experiment were not high enough to produce maximum gains. The need for methionine supplementation in opaque-2 corn diets is also questionable. In only one of the replicated lots was daily gain increased when methionine was added to the diet. Therefore, it does not appear that it is the second limiting amino acid in opaque-2 corn diets, if it is in fact deficient.

Plasma free amino acid levels indicated that lysine was the most needed of the five amino acids studied and that the need for methionine and isoleucine supplementation of opaque-2 corn is questionable.

Summary

Eighty-four early weaned pigs were fed opaque-2 corn diets supplemented with lysine, methionine, tryptophan, threonine and isoleucine. From the data found in this experiment it appears that lysine, tryptophan and threonine are the three most limiting amino acids in opaque-2 corn. Methionine and isoleucine did not appear to be deficient in the opaque-2 corn diet.

Table 1. Composition of Diets (%)

Treatment	1	2	3	4	5	6	7
Ground yellow corn	--	--	--	--	--	--	69.5
Opaque-2 corn	96.2	95.8	95.5	95.5	95.4	95.2	--
Soybean meal (44%)	--	--	--	--	--	--	26.7
Dicalcium phosphate	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Ground limestone	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Trace mineralized salt	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Premix[a]	0.8	0.8	0.8	0.8	0.8	0.8	0.8
L-lysine	--	0.4	0.4	0.4	0.4	0.4	--
DL-methionine	--	--	0.25	0.25	0.25	0.25	--
DL-tryptophan	--	--	--	0.05	0.05	0.05	--
DL-threonine	--	--	--	--	0.15	0.15	--
DL-isoleucine	--	--	--	--	--	0.15	--

[a]Provided 1536 IU of vitamin A, 354 IU of vitamin D, 1.6 mg of riboflavin, 6.4 mg of pantothenic acid, 12.8 mg of niacin, 64 mg of choline, 9.6 mcg of vitamin B_{12} and 125 mg CSP-250 per lb. of diet.

Table 2. Effect of Amino Acid Supplementation of Opaque-2 Corn on Growth Performance of Growing Pigs

Treatment	1	2	3	4	5	6	7
Number of pigs[a]	12	12	12	12	12	12	12
Avg. initial wt., lb.	28.4	28.4	28.4	28.4	28.4	28.4	28.4
Avg. final wt., lb.	53.8	58.8	60.9	63.8	69.5	70.0	73.3
Avg. daily gain, lb.	0.73	0.86	0.92	1.01	1.17	1.19	1.28
Avg. daily feed, lb.	2.84	2.88	2.97	3.32	3.23	3.37	3.17
Feed/gain	3.92	3.35	3.21	3.28	2.76	2.83	2.48

[a]Three replicated lots of four pigs each.