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SUPPLEMENTAL LYSINE IN DRINKING WATER OF GROWING-FINISHING SWINE FED RATIONS OF TWO DIFFERENT PROTEIN LEVELS

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Cereal grains do not contain an adequate amount of the amino acids (protein building blocks) to support optimum growth of growing-finishing pigs.

The protein present in cereal grains is of relatively "poor quality" since it does not contain the proper balance of amino acids to support optimum growth of growing-finishing swine. The most limiting amino acid in cereal grains is lysine. Protein supplements, such as soybean meal, contain larger amounts of the essential amino acids and thus are used to balance a cereal grain ration.

Previous research at this station, however, has shown that a corn-soybean meal ration can often be improved with lysine supplementation to the drinking water of growing pigs. These trials were conducted to obtain further information on the effect of adding 4 gm. of L-lysine monohydrochloride per gallon of drinking water to pigs fed corn-soybean meal rations of two protein levels.

Experimental Procedure

Four trials were conducted in this experiment. All pigs were self-fed the ration shown in table 1. Water was provided ad libitum to all pigs. The pigs were kept on concrete in combination sleeping quarters and outside feeding pens. At 210 to 220 lb. average lot weight each lot was individually weighed off the trials.

The four experimental treatments in all trials were:

Treatments	I	Low protein (12%)
	II	High protein (16%)
	III	Low protein (12%) + 4 gm. L-lysine per gal. of water
	IV	High protein (16%) + 4 gm. L-lysine per gal. of water

A total of 136 animals were used in this experiment. Sex differences were eliminated by randomly allotting equal numbers of barrows and gilts to each treatment.

Results

Trial 1

In trial 1, the addition of 4 gm. of lysine per gallon of water improved the average daily gain of the pigs fed the low protein rations by 20% and improved the feed efficiency by 19%. The difference in average daily gain developed early in the trial and was maintained throughout the feeding period. The rate of gain of the pigs fed the low protein ration and lysine in the drinking water was slightly less than the gain of those pigs fed the high protein rations with or without lysine supplementation. Feed efficiency, however, was similar to that of the pigs fed the high protein ration with lysine in the water.

Table 1. Composition of Rations, Lb.

Feeding period	Start to finish	Start to finish
Crude protein, %	16	12
Shelled corn, lb.	1590	1780
Soybean meal, 50%, lb.	350	160
Dicalcium phosphate, lb.	34	36
Limestone, lb.	12	6
Trace mineral salt, lb.	10	10
Vitamin-antibiotic premix[a]	2.5	2.5

[a] Provided 1135 I.U. vitamin A, 340 I.U. vitamin D, 4 mg. riboflavin, 8 mg. calcium pantothenate, 16 mg. niacin, 20 mg. choline chloride, 10 mcg. vitamin B_{12} and 1.13 gm. SP-250 per pound of ration.

The addition of lysine to the water of the high protein lots (16% C.P.) did not have the same effect. There was no difference in over-all average daily gain, but the pigs receiving the lysine addition to the water did show an increase in average daily gain during the early part of the trial when the animals' protein requirements would be slightly higher.

Lysine in the water appeared to have some effect on feed consumption and feed utilization when the protein content of the feed was held below the normal recommended requirement levels. The pigs supplied the lower protein ration with lysine in the water required 77 lb. less feed per 100 lb. gain than pigs fed the same ration without lysine in the water.

Table 2. Results of Lysine in Water, Trial 1

	High protein		Low protein	
	No lysine	Lysine	No lysine	Lysine
Number of pigs	8	8	8	8
Av. initial wt., lb.	66.3	64.9	65.4	65.8
Av. final wt., lb.	214.5	217.5	210.2	213.1
Av. daily gain, lb.	2.00	2.06	1.57	1.89
Av. daily feed, lb.	6.00	6.66	6.24	6.02
Av. daily water, gal.	1.39	1.26	1.18	1.40
Av. feed per lb. gain, lb.	3.00	3.23	3.96	3.19
Total lysine, gm.	---	2,984	---	3,500

Trial 2

The pigs used in trial 2 were heavier at the beginning of the trial than those in trial 1 (approximately 89 lb. vs. 66 lb.). Lysine addition to the water did not improve the average daily gain or the feed efficiency of either the low or the high protein groups. In this trial the low protein lot with added lysine had

a slower rate of gain and higher feed requirement than did the control lot due to two pigs that did not grow at a normal rate. There was not any difference in the average daily gain between treatments at the high protein level.

These results indicate that the response to lysine is expressed at a younger age and lighter weight when pigs are fed rations of the type used here.

Table 3. Results of Lysine in Water, Trial 2

	High protein		Low protein	
	No lysine	Lysine	No lysine	Lysine
Number of pigs	8	8	8	8
Av. initial wt., lb.	87.8	89.8	89.0	88.9
Av. final wt., lb.	210.0	211.6	213.8	214.6
Av. daily gain, lb.	1.94	1.93	2.01	1.72
Av. daily feed, lb.	6.35	6.04	6.44	6.11
Av. daily water, gal.	1.46	1.51	1.43	1.18
Av. feed per lb. gain, lb.	3.28	3.12	3.20	3.55
Total lysine, gm.	---	3,048	---	2,752

Trial 3

In trial 3 lysine addition to the water did not significantly improve the average daily gain of the pigs fed the high protein ration. However, pigs receiving lysine in water and the low protein feed gained 8% faster than those fed the low protein feed without lysine. It should be noted that all four groups gained at a very rapid rate (1.99 to 2.24 lb. per day).

Pigs fed the high protein ration with lysine in water required 34 lb. less feed per 100 lb. of gain than did those without the lysine. Feed efficiency was improved 5.4 and 10.2% when pigs received lysine and the low and high protein rations, respectively.

Table 4. Results of Lysine in Water, Trial 3

	High protein		Low protein	
	No lysine	Lysine	No lysine	Lysine
Number of pigs	6	6	6	6
Av. initial wt., lb.	66.5	66.0	66.7	66.5
Av. final wt., lb.	221.8	220.5	220.2	220.3
Av. daily gain, lb.	2.19	2.24	1.99	2.17
Av. daily feed, lb.	7.29	6.70	6.97	7.18
Av. daily water, gal.	1.62	1.23	1.29	1.20
Av. feed per lb. gain, lb.	3.33	2.99	3.50	3.31
Total lysine, gm.	---	2,032	---	2,040

Trial 4

The pigs used in trial 4 were approximately the same weight as those used in trials 1 and 3. This trial was set up as two experiments, one experiment at each protein level. Therefore, all comparisons should be made within the protein groups and not between them.

The addition of lysine to the water did not improve the average daily gain or feed efficiency of pigs fed the high protein ration. Pigs fed the low protein ration and lysine in the water gained approximately 7.2% (average of both replicates) faster than those that did not receive lysine in water. Feed efficiency was improved approximately 9% in both replicates receiving the lysine water.

Table 5. Results of Lysine in Water, Trial 4

	No lysine		Lysine	
	Rep I	Rep II	Rep I	Rep II
	High Protein			
Number of pigs	6	6	6	6
Av. initial wt., lb.	64.17	66.17	64.17	63.67
Av. final wt., lb.	202.67	202.00	200.83	199.53
Av. daily gain, lb.	1.90	1.86	1.77	1.86
Av. daily feed, lb.	5.95	5.95	5.49	6.04
Av. daily water, gal.	1.43	1.37	1.26	1.51
Av. feed per lb. gain, lb.	3.14	3.20	3.09	3.25
Total lysine, gm.	---	---	2,324	2,644
	Low Protein			
Number of pigs	6	6	6	6
Av. initial wt., lb.	54.00	54.83	53.50	54.50
Av. final wt., lb.	200.60	202.83	199.30	205.00
Av. daily gain, lb.	1.61	1.57	1.68	1.73
Av. daily feed, lb.	5.38	5.58	5.09	5.53
Av. daily water, gal.	1.02	1.01	0.96	1.15
Av. feed per lb. gain, lb.	3.33	3.55	3.04	3.20
Total lysine, gm.	---	---	2,000	2.396

Summary

The results of these trials indicate that a 16% protein corn-soybean meal ration is not improved by the addition of 4 gm. of lysine per gallon of drinking water.

The results of these trials indicate that the performance of pigs weighing 60 lb. or more is not improved by adding lysine to the drinking water when they are fed a 16% protein corn-soybean meal ration. However, pigs weighing from 53 to 66 lb. when started on experiment did gain faster and more efficiently when they received 4 gm. of lysine per gallon of water along with a 12% corn-soybean meal ration. In most cases pigs fed the lower protein ration plus lysine performed equal to those fed the higher protein ration. Pigs weighing 89 lb. initially did not respond to lysine on the 12% protein ration indicating that amino acid requirements do decrease with age and weight of the pigs.