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Comparison of lactation diets containing various protein sources on sow and litter performance

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COMPARISON OF LACTATION DIETS CONTAINING VARIOUS PROTEIN SOURCES ON SOW AND LITTER PERFORMANCE¹

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Summary

A total of 188 lactating sows was used in Exp. 1 to determine the influence of a complex lactation diet containing oats, linseed meal, and alfalfa meal compared with a corn-soybean meal diet on sow and litter performance. No differences in sow and litter performance were observed. Therefore, a simple corn-soybean meal diet was adequate to maximize sow productivity. Average daily feed intake (ADFI) of sows by parity was also examined in Exp. 1. The ADFI of parity 1 sows was considerably lower than that of parity 3 sows, but litter weaning weights were similar. Thus, lactation diet formulation should account for the differences in feed intake by parity and be formulated on ADFI (average daily feed intake) and level of production. A total of 198 lactating sows was used in Exp. 2 to determine the influence of substituting 3 lb/ton of L-lysine HCl and corn for soybean meal in the lactation diet. No differences in sow and litter performances were observed. However, ADFI was excellent for both treatments, resulting in average daily lysine intakes of 67.6 and 69.7 g per day. This is approximately 14 g in excess of the reported requirement for this level of production. Thus, further research is needed to assess the use of L-lysine HCl in lactation diets.

(Key Words: Sows, Protein, Lysine.)

Introduction

Previous research has indicated that the high producing sow has a lysine requirement greater than NRC estimates to maximize sow and litter performance. Research also has shown that sow and litter performance is improved with increased feed intake in sows with a high genetic potential for milk production. Therefore, some swine industry personnel feel that a complex lactation diet with alternative protein sources will stimulate lactation feed intake, resulting in increased performance. Accordingly, the first experiment compared the influence on sow and litter performance of a complex lactation diet containing the alternative protein sources linseed meal, alfalfa meal, and oats versus a simple corn-soybean meal-based diet. The objective of the second experiment was to examine the influence of a corn-soybean meal diet with or without 3 lb/ton of lysine-HCl on sow and litter performance. This was based on the hypothesis that inclusion of 3 lb/ton of synthetic lysine in lactation diets would result in deficiencies of threonine and valine, which would limit sow performance.

Procedures

Experiment 1. On a commercial swine operation, 188 lactating sows were allocated randomly at farrowing to one of two diets. The diets were formulated to contain .98%

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lysine (Table 1). The simple diet was corn-soybean meal-based, and the complex diet contained 2.5% oats, 1.25% linseed meal, and 1.25% alfalfa meal. The diets were both supplemented with 2 lb L-lysine HCl per ton. The experiment was conducted from August to December, 1993.

Experiment 2. On the same commercial swine operation as Exp. 1, 198 lactating sows were allocated randomly at farrowing to one of two corn-soybean meal-based diets (Table 1). The two diets were formulated to contain .98% lysine. However, one diet had 3 lb/ton L-lysine HCl per ton and corn substituted for soybean meal on an equal lysine basis. The experiment was conducted from February to June, 1994.

During both experiments, litters were equalized within treatment by 48 h post-farrowing. Litters were weighed at birth and weaning (15.8 d, Exp. 1 and 15.6 d, Exp 2). Sows were provided ad libitum access to feed and water, and feed intake was recorded daily. Sows were housed in individual farrowing crates in environmentally controlled farrowing rooms. The minimum air temperature in the farrowing room was 68°F. Supplemental heat was provided in the piglet creep area. Piglets had no access to creep feed.

Results and Discussion

Experiment 1. Sow and litter performance was excellent for both treatments. No differences were observed in sow and litter performance between treatments, including ADFI and litter weaning weight. Results of this experiment indicate that oats, linseed, or alfalfa meal did not improve sow or litter performance. A simple corn-soybean meal diet would necessitate the procurement of fewer ingredients and simplify manufacture of the lactation diet.

Listed in Table 3 are ADFI and litter performance by parity. The results indicate a significant effect of parity on ADFI ($P < .01$). Parity 1 and 2 sows had lower ADFI than parity 3 to 6 sows. However, litter weaning weights were similar, which indicate that milk production was similar across parities. Thus, if one diet was fed in lactation, amino acid intake would be 30% lower in parity 1 and 2 sows, and the resulting deficit for milk production would have to be mobilized from body stores and could compromise subsequent reproductive performance. Therefore, lactation diets customized to herd ADFI and production levels may cause some parities to be underfed. Level of production and ADFI by parity should be considered when formulating lactation diets.

Experiment 2. Sow and litter performance was again excellent for both groups. Litter weaning weights averaged 101.7 and 101.2 lb for control and lysine treatments, respectively, with an average lactation length of 15.6 days. The excellent litter performance is a reflection of the high ADFI of the sows. Lysine intake averaged nearly 70 g/day or approximately 14 g per day greater than recommended for this level of production. Valine intake averaged 59 g/d and 66 g/d for the 3 lb/ton lysine-HCl and control sows, respectively. Threonine intake averaged 46 g/d and 52 g/d for the 3 lb/ton lysine-HCl and control sows, respectively. Subsequently, with lysine in excess of the requirement, threonine and valine, the most limiting amino acids, also may have been above the requirement, explaining why no differences were observed in sow and litter performance. Thus, further research is needed to assess the use of L-lysine HCl in lactation diets.

Table 1. Diet Composition

Item, %	Exp. 1		Exp. 2	
	Simple	Complex	Control	Lysine
Corn	71.50	67.40	67.32	71.33
Soybean meal (46.5 % CP)	22.47	21.63	26.89	22.63
Monocalcium phosphate (21 % P)	2.64	2.61	2.56	2.63
Oats	--	2.50	--	--
Alfalfa meal	--	1.25	--	--
Linseed meal	--	1.25	--	--
Soy oil	1.00	1.00	1.00	1.00
Salt	.50	.50	.50	.50
Trace mineral and vitamin premix ^a	.75	.75	.75	.75
Lysine-HCl	.1	.1	--	.15
Total	100.00	100.00	100.00	100.00

^aTo provide a minimum of per ton: 150 g Zn, 150 g Fe, 36 g Mn, 15 g Cu, 270 mg I, 270 mg Se, 10 million IU vitamin A, 1.5 million IU vitamin D, 40 thousand IU vitamin E, 30 mg B₁₂, 7.5 g riboflavin, 11 g pantothenic acid, 45 g niacin, 500 g choline, 200 mg biotin, 1500 mg folic acid.

Table 2. Sow and Litter Performance (Exp. 1)^a

Item	Simple	Complex	P-Value	CV
Number of sows	98	90	--	--
ADFI, lb	14.4	14.9	.17	17.0
Pigs weaned	9.0	9.2	.21	12.7
Litter weaning weight, lb	96.1	97.8	.47	15.8
Average weaned pig weight, lb	10.7	10.7	.83	12.0
Wean to 1st service, d	5.9	7.1	.21	85.9

^aSows were blocked on parity. Lactation length and litter birth weight were used as covariates. No treatment by covariate interactions were noted. Average lactation length was 15.8 days, and average litter birth weight was 35.3 lb.

Table 3. Effect of Parity on Sow and Litter Performance (Exp. 1)^a

Item	Parity						CV
	1	2	3	4	5	6	
Number of sows	43	30	21	27	20	38	--
ADFI, lb	11.3	13.5	15.1	14.6	16.1	15.3	17.0
Lysine, g/d	50.2	60.0	67.1	64.8	71.5	67.9	--
Litter weaning wt, lb	100.5	98.2	104.2	96.9	98.6	103.5	15.8
Wean to 1st service, d	11.8	8.2	7.6	4.9	5.1	5.7	85.9

^aLactation length and litter birth weight were used as covariates. No treatment by covariate interactions were noted. Average lactation length was 15.8 days.

Table 4. Sow and Litter Performance (Exp. 2)^a

Item	3 lb Lysine	Control	P-Value	CV
Number of sows	99	99	--	--
ADFI, lb	15.3	15.8	.37	24.4
Lysine intake, g/d	67.6	69.9	.37	24.4
Pigs weaned	9.3	9.3	.99	16.7
Litter weaning weight, lb	101.2	101.7	.86	18.0
Average weaned pig weight, lb	11.0	11.0	.94	12.3
Wean to 1st service, d	6.1	7.1	.41	96.0

^aLactation length was used as a covariate. No treatment by covariate interactions were noted. Average lactation length was 15.6 days.