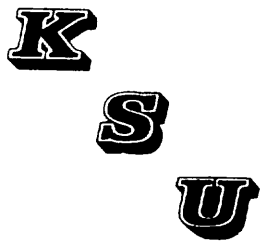

LECITHIN ADDITION TO STARTER PIG DIETS WITH AND WITHOUT ADDED FAT AND WHEY

Debbie M. Van Wormer and D. Steven Pollmann

Summary

A total of 316 crossbred weanling pigs were used in two studies to evaluate the effect of the addition of edible-grade, unbleached soy lecithin on growth in starter pig diets with and without added fat and/or dried whey. Addition of fat to a corn-soybean meal diet improved ($P<.05$) feed efficiency but addition of lecithin did not affect performance. When lecithin and fat were added in combination, average daily gain was less ($P<.05$) than for diets without added fat. This may be due to a high level of undigestible fat having a limiting effect on intake and consequently decreasing gains. A low level of lecithin (1.5%) in diets without whey gave approximately the same response as a 4% fat diet without whey, thus making lecithin a possible fat substitute should, it be economically feasible.

Introduction

With producers attempting to wean pigs at an earlier age, it is important that they be provided an adequate diet and environment for survival during this critical time. Addition of fat to the diets of starter pigs may improve performance during this time of low nutrient intake. However, fat tends to be an expensive ingredient and at high levels can cause handling problems. Lecithin, a by-product of soybean processing and a component of fat, makes fat more dispersible in aqueous solutions, possibly leading to better utilization of dietary fat. Ultimately, this could lead to lecithin as a fat substitute or to lower percentages of fat in the diet and possibly decrease feed production costs.

Procedure

Pigs were weaned at approximately 21 days of age, placed into an environmentally controlled nursery, and allowed a 1-week adjustment period. In the first study, the pigs were randomly allotted to one of six treatments (2x3 factorial design), with four pigs per pen and five replications per treatment. The basal diet consisted of a corn-soybean meal base fortified with vitamins and minerals fed in a meal-form. The basal diet was supplemented with 0, 1.5, or 3.0% lecithin[1] and 0 or 4% choice white grease to give six dietary treatments (table 1). Constant calorie to protein and protein to lysine ratios were maintained in all treatments (table 2). A second study was different only in that there were seven pigs per pen and all six treatments contained 20% spray-dried whey (table 3). Feed and water were available ad libitum and pigs were weighed at weaning and every 2 wks thereafter for 6 wk. Feed intake, average daily gain, and feed efficiency were calculated.

[1] Merrick Foods, Union Center, WI

Results and Discussion

The addition of 4% choice white grease to diets without dried whey decreased feed intake and improved feed efficiency. However, there was no significant change in average daily gain (table 4). Addition of lecithin at 1.5 or 3.0% to the fat-supplemented diets showed no improvement in pig performance compared to the control diet, nor was there any lecithin-fat interaction. A low level of lecithin in the diet without added fat gave a response similar to those diets with 4% added fat. This suggests the possibility of using lecithin as a fat substitute.

In diets containing 20% dried whey, a significant response was observed also in decreased feed intake and improved feed efficiency with the addition of 4% choice white grease (table 5). Average daily gains remained unchanged and no significant response to the addition of lecithin was observed. There was, however, a lecithin-fat interaction ($P<.05$) which affected average daily gain. In diets without lecithin, average daily gain increased with the addition of fat but decreased when 1.5 or 3.0% lecithin was added. The treatment having 4% fat and 3% lecithin had the lowest average daily gain. From these two studies it was concluded that lecithin did not affect feed utilization in the starter pig diets and did not appear to influence the utilization of fat.

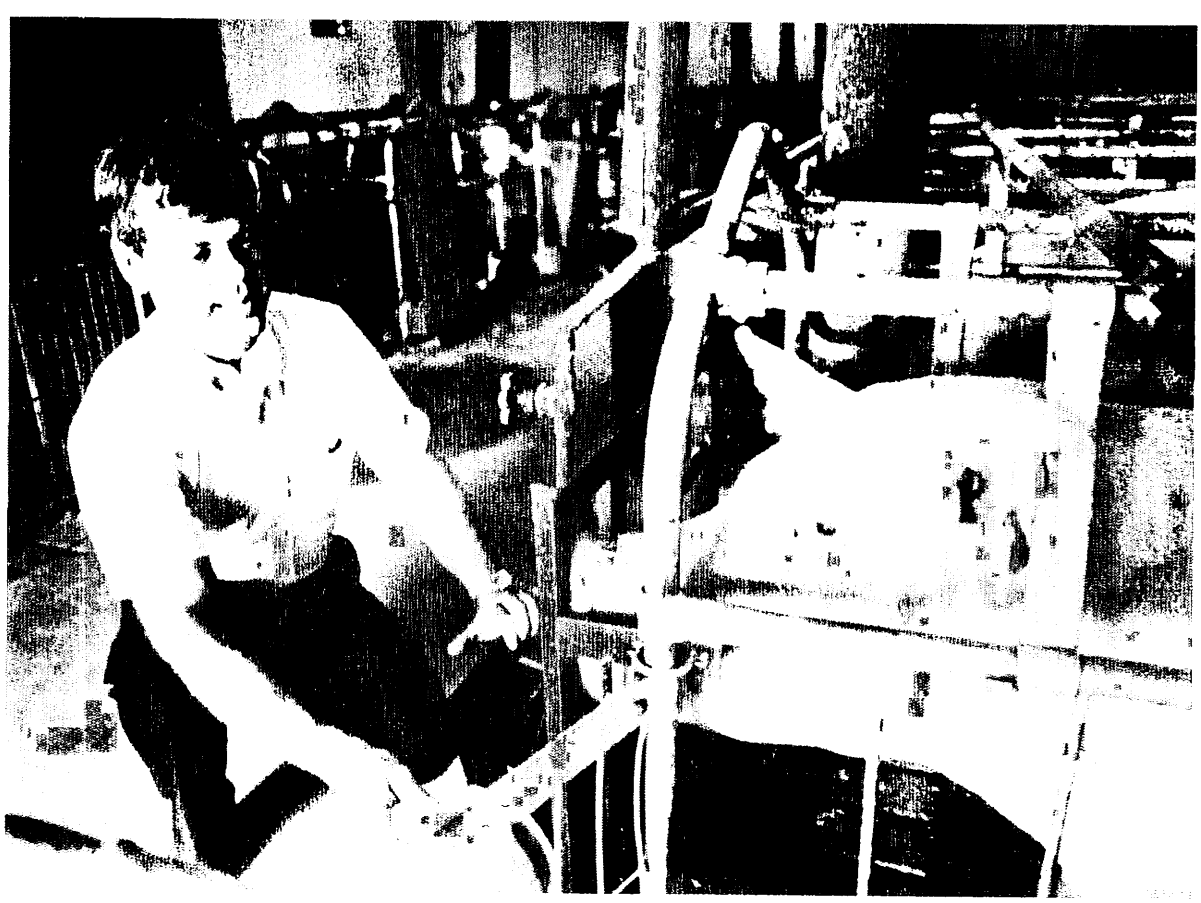

Table 1. Fatty Acid Profiles for Lecithin and Choice White Grease

Chain length	Percentage Composition	
	Choice white grease	Lecithin
10:0	.05	—
12:0	.07	—
14:0	1.21	.08
15:0	.03	.11
16:0	22.99	16.10
16:1	3.26	—
16:2	.76	.11
17:1	.85	.03
18:0	13.87	4.13
18:1	43.20	17.81
18:2	10.24	54.18
18:3	1.71	7.01
20:0	1.00	—
20:1	.57	—
20:4	.21	.38
22:0	—	.08
Total	100.02	100.02

[a]Analysis of fatty acids conducted by Woodson-Tenant Laboratories, Des Moines, Iowa.

Table 2. Diet Composition for Trial 1

Lecithin,%	0	1.5	3.0	0	1.5	3.0
Fat,%	0	1.5	3.0	0	1.5	3.0
Ingredients, lb/ton						
Corn	1268	1268	1268	1112	1112	1112
Soybean meal,44%	588	588	588	664	664	664
Wheat starch	60	30	—	60	30	—
Choice white grease	—	—	—	80	80	80
Soy lecithin	—	30	60	—	30	60
L-lysine HCl	7	7	7	7	7	7
Dical (18% Ca, 21% P)	32	32	32	32	32	32
Limestone	21	21	21	21	21	21
Salt	5	5	5	5	5	5
TM premix, high Zn	2	2	2	2	2	2
Vitamin premix	10	10	10	10	10	10
Selenium premix	2	2	2	2	2	2
ASP-250	5	5	5	5	5	5
Calculated values						
% Protein	18.58	18.58	18.58	19.55	19.55	19.55
% Lysine	1.26	1.26	1.26	1.37	1.37	1.37
% Ca	.85	.85	.85	.86	.86	.86
% P	.70	.70	.70	.70	.70	.70
Protein:lysine	14.75:1	14.75:1	14.75:1	14.27:1	14.27:1	14.27:1
Kcal ME:gm protein	17.18	17.4	17.62	17.14	17.35	17.56

Table 3. Diet Composition for Trial 2

Lecithin, %	0	1.5	3.0	0	1.5	3.0
Fat, %	0	0	0	4	4	4
Ingredients, lb/ton						
Corn	932.2	933.2	933.2	784.8	784.8	784 .8
Soybean meal,44%	548.6	548.6	548.6	620.0	620.0	620.0
Dried whey, spray	400.0	400.0	400.0	400.0	400.0	400.0
Wheat starch	60.0	30.0	—	60.0	30.0	—
Soy lecithin	—	30.0	60.0	—	30.0	60.0
Choice white grease	—	—	—	80.0	80.0	80.0
L-lysine HCl	4.2	4.2	4.2	4.6	4.6	4.6
Dical (18% Ca, 21% P)	24.6	24.6	24.6	20.0	20.0	20.0
Limestone	13.4	13.4	13.4	14.6	14.6	14.6
Salt	2.0	2.0	2.0	2.0	2.0	2.0
TM premix, high Zn	2.0	2.0	2.0	2.0	2.0	2.0
Vitamin premix	5.0	5.0	5.0	5.0	5.0	5.0
Selenium premix	2.0	2.0	2.0	2.0	2.0	2.0
ASP-250	5.0	5.0	5.0	5.0	5.0	5.0
Calculated values						
% Protein	18.6	18.6	18.6	19.5	19.5	19.5
% Lysine	1.25	1.25	1.25	1.35	1.35	1.35
% Ca	.8	.8	.8	.8	.8	.8
% P	.7	.7	.7	.7	.7	.7
Protein:lysine	14.88:1	14.88:1	14.88:1	14.44:1	14.44:1	14.44:1
Kcal ME:gm protein	17.2	17.4	17.6	17.2	17.5	17.7

Table 4. Effect of Lecithin Addition to Starter Pig Diets (Trial 1).

Item	% Fat	% Lecithin 0	1.5	3.0	Mean	SE
Average daily feed intake (lbs)						
	0	1.30	1.18	1.30	1.26[a]	.050
	4	1.17	1.98	1.05	1.06[b]	
	Mean	1.23	1.07	1.17		.062
Average daily gain (lbs)						
	0	.94	.92	.97	.94	.031
	4	.94	.82	.82	.86	
	Mean	.94	.87	.89		.038
Feed efficiency						
	0	1.38	1.27	1.34	1.33[a]	.029
	4	1.23	1.19	1.28	1.23[b]	
	Mean	1.31	1.23	1.31		.036

[ab]Dietary fat effect ($P<.05$).

Table 5. Effect of Lecithin Addition to Starter Pig Diets with 20% Dried Whey.

Item	% Fat	% Lecithin 0	1.5	3.0	Mean	SE
Average daily feed intake (lbs)						
	0	1.55	1.56	1.63	1.58[a]	.038
	4	1.48	1.43	1.46	1.46[b]	.046
	Mean	1.52	1.50	1.54		
Average daily gain (lbs)[c]						
	0	1.02	1.04	1.06	1.04	.016
	4	1.12	1.06	1.00	1.06	
	Mean	1.07	1.05	1.03		.020
Feed efficiency						
	0	1.52	1.50	1.54	1.52[a]	.026
	4	1.32	1.36	1.45	1.37[b]	
	Mean	1.42	1.43	1.50		.031

[ab] Dietary fat effect (P<.05).

[c] Lecithin x fat interaction (P<.05).