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Soybean Protein in Milk Replacer Diets for Baby Pigs



Gary L. Allee, Po-Heng Hsu and Randall S. Prather



Summary

Two trials, involving 108 pigs, were conducted to evaluate the effects of replacing milk protein with various levels of soybean protein in milk-replacer diets. Pigs fed diets in which 25 or 50% of the milk protein was replaced with a modified soybean had weight gains and efficiencies similar to those of pigs fed the all-milk-protein diet, but incidence of scours decreased. Protein digestibility decreased as the level of soybean protein in the diet increased. These results suggest that 25 to 50% of the milk protein in a 28% protein milk replacer diet can be replaced with a modified soybean protein, thereby greatly reducing feed cost.

Introduction

We reported previously (Swine Day, 1979) that pigs can be successfully reared artificially with minimum costs in equipment and time. In past experiments, the milk replacer used was an all milk protein product. Because milk protein is much more expensive than soybean protein, we considered it economically important to determine if soybean protein can be used as a partial replacement for the more expensive milk protein in a pig milk replacer.

Experimental Procedures

Pigs were removed from sows 15 to 24 hours after birth and taken to a separate room where the temperature was maintained at 90-93°F. Pigs were placed in individual cages (1'x 2'x 1') made of 1" x 2" welded wire, with 1/4" netting on the floor of the cages. Each cage was equipped with a plastic feeding cup with a capacity of 200 milliliters. In both trials pigs were allotted to treatments based on litter and weight. Pigs were fed to appetite four times a day on day 1, three times a day on day 2, then twice daily through day 21. All trials lasted 20 days.

Feces were collected from three pigs per treatment on days 10-14 to allow evaluation of the digestibility of the protein in the diets.

Trial I. Sixty pigs from seven litters were allotted based on litter initial weight to five treatments: 1) all milk protein; 2) 25% "modified soy protein"; 3) 50% "modified soy protein"; 4) 75% "modified soy protein"; and 5) 50% soy flour. The modified soy protein is a patented product of Land O'Lakes, Inc. All diets contained 28% crude protein, 10% fat, .85% calcium, and .78% phosphorus.

Trial II. Forty-eight pigs from eight litters were allotted to six treatments based on litter and initial weights: 1) all milk protein; 2) 25% "modified soybean protein"; 3) 50% "modified soybean protein"; 4) 75% modified soybean protein"; 5) 50% soy flour; and 6) 75% soy flour.

Results and Discussion

In both trials, pigs fed diets in which modified soy protein replaced 25 or 50% of the milk protein gained at the same rate as did pigs fed the all milk protein diet (Tables 3 and 4). Replacing 75% of the milk protein with modified soy protein or soy flour reduced pig gains and required more feed per pound of gain.

Table 3. Pig Performance (Trial I^a)

Treatment	Weights, lb.			
	Initial	Final	Gain	Feed/gain
1. All milk protein	2.95	9.99	7.04	.87
2. 25% "modified soy"	3.01	10.41	7.40	.85
3. 50% "modified soy"	3.01	10.30	7.29	.90
4. 75% "modified soy"	2.99	9.39	6.40	.96
5. 50% soy flour	2.97	9.68	6.71	.92

^aEach value is the mean of 12 individually fed pigs.

Table 4. Pig Performance (Trial II^a)

Treatment	Weights, lb.			
	Initial	Final	Gain	Feed/gain
1. All milk protein	3.44	11.05	7.61	.81
2. 25% "modified soy"	3.42	11.27	7.85	.81
3. 50% "modified soy"	3.42	10.46	7.04	.92
4. 75% "modified soy"	3.42	8.51	5.09	1.1
5. 50% soy flour	3.41	9.60	6.19	1.0
6. 75% soy flour	3.47	8.81	5.34	1.0

^aEach value is the mean of 8 individually fed pigs.

Protein digestibility decreased ($P < .05$) as the level of soy protein in the diet was increased (Tables 5 and 6). Energy digestibility was also lower on the soy protein diets.

Mortality for Trial I is shown in Table 7. There were no differences between treatments. In Trial II, only one pig on the 50% soy flour diet died.

Incidence of scours was less ($P < .05$) for pigs fed the diets with 25 or 50% soy protein than for pigs fed the all-milk protein.

These results suggest that soy protein can replace 25 to 50% of the milk protein in a 28% protein milk replacer diet for young pigs without decreasing pig performance.

Table 5. Apparent Digestibilities (Trial I^a)

Treatment	Apparent digestibilities, %	
	D.M.	Protein
1. All milk	97.2±1.4	95.3±1.2
2. 25% "modified soy"	94.2±2.8	93.6±2.3
3. 50% "modified soy"	95.4±2.8	91.8±1.5
4. 75% "modified soy"	92.5±1.8	89.6±.5
5. 50% soy flour	93.0±1.7	94.3±1.6

^aEach value is the mean of 3 pigs from day 10-14.

Table 6. Apparent Digestibilities (Trial II^a)

Treatments	Apparent digestibilities, %	
	Energy	Protein
1. All milk	97.2	97.8
2. 25% "modified soy"	95.1	95.8
3. 50% "modified soy"	91.6	92.9
4. 75% "modified soy"	87.4	90.0
5. 50% "soy flour"	89.8	92.0
6. 75% soy flour	80.4	87.9

^aEach value is the mean of 3 pigs from day 10-14.

Table 7. Mortality (Trial I)

Treatments	No. pigs	Mortality
1. All milk	12	1
2. 25% "modified soy"	12	0
3. 50% "modified soy"	12	1
4. 75% "modified soy"	12	1
5. 50% soy flour	12	1