FAT ADDITION TO WHEAT BASED DIETS FOR GROWING-FINISHING SWINE

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Story in Brief

A study involving a total of 398 growing-finishing swine was conducted to determine the effect of adding fat to wheat based diets on performance. Average daily gain during the growing and finishing periods was reduced by 8 and 4 percent, respectively in pigs fed a wheat-soybean meal diet compared to those fed the corn-soybean meal diet. Feed efficiency was similar between pigs fed the wheat or corn-soybean meal diet. Addition of fat to the wheat diet to provide a diet isocaloric with the corn-based diet (1.5 percent fat) improved gain and feed efficiency in the finishing, but not the growing period. Addition of fat at a level of 5 percent to the wheat-soybean meal diet improved gain by 6 and 5 percent, respectively in the growing and finishing phases when compared to pigs fed a wheat-soybean meal control diet. Similarly, feed efficiency was improved by 6.0 and 10 percent during the growing and finishing phase, respectively by the addition of 5 percent fat. Backfat was increased in pigs fed the high fat diet when compared to those fed the wheat-soybean meal diet. This study suggests that adding fat to wheat based diets may improve gain and efficiency in growing-finishing swine to levels equivalent to those observed in pigs fed corn based diets.

(Key words: Swine, Wheat, Corn, Fat)

Introduction

A summary of studies comparing wheat with corn based diets at Oklahoma State University indicate that gain and efficiency are reduced slightly when wheat is substituted for corn in swine growing-finishing diets. One possible explanation for these differences in performance may be due to the lower fat and energy content of wheat. Diets formulated on an equal energy basis, as is commonly the procedure used by large swine feeding companies and the feed manufacturing industry, may result in a more favorable comparison of wheat vs. corn. Fat is the dietary constituent commonly used to adjust energy levels in swine diets. This experiment was conducted to determine the effect of adding fat on performance of growing-finishing swine fed wheat based diets.

Materials and Methods

This study was conducted at the Southwestern Livestock and Forage Research Station, El Reno, Oklahoma and involves a total of 26 pens and 398 growing-finishing swine. All diets were formulated to contain 0.75 percent lysine during the growing phase pig weights of (43 to 121 lb.) and 0.65 percent lysine during the finishing phase pig weights of (121 to 225 lb.). The four treatments (Table 1) were : (1) a control

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Table 1. Composition of Experimental Rations. Growing Phase

Ingredients	Treatment			
	Corn	Wheat	Wheat + 1.50% fat	Wheat + 5.00% fat
	---------Composition (as-fed)----			
Wheat, hard red winter		80.62	78.95	75.17
Corn	77.12	--	--	
Soybean meal, 44%	19.03	15.75	15.60	15.00
Fat (80%)[a]	--	--	1.83	6.25
Dicalcium phosphate	1.84	1.46	1.45	1.35
Calcium carbonate	0.76	0.92	0.92	0.98
Salt	0.50	0.50	0.50	0.50
Vitamin TM Premix[b]	0.25	0.25	0.25	0.25
Aureomycin 10[c]	0.50	0.50	0.50	0.50
Calculated Composition				
Metabolizable energy, kcal	1446	1412	1446	1522
Crude protein, %	15.16	16.77	16.79	16.77
Lysine, %	0.75	0.75	0.75	0.75
Ca, %	0.75	0.75	0.75	0.75
P, %	0.65	0.65	0.65	0.65
Finishing Phase				
Wheat, hard red winter	--	80.70	84.75	81.25
Corn	82.65	--	--	
Soybean meal, 44%	14.06	10.25	10.25	9.50
Fat (80%)[a]	--	--	1.95	6.25
Dicalcium phosphate	1.68	1.25	1.25	1.15
Calcium carbonate	0.76	0.95	0.95	1.00
Salt	0.50	0.50	0.50	0.50
Vitamin TM premix[b]	0.25	0.25	0.25	0.25
Aureomycin 10[c]	0.10	0.10	0.10	0.10
Calculated Composition				
Metabolizable energy, kcal	1456	1420	1456	1530
Crude protein, %	13.46	15.09	15.16	15.09
Lysine, %	0.62	0.62	0.62	0.62
Ca, %	0.70	0.70	0.70	0.70
P, %	0.60	0.60	0.60	0.60

[a]Dry Fat 480, Merrick Foods, Middleton, Wisconsin.
[b]Supplied 4,000,000 IU vitamin A, 3,000,000 IU vitamin D, 4g riboflavin, 20 g pantothentic acid, 30 g niacin, 800 g choline chloride, 15 mg vitamin B12, 10,000 IU vitamin E, 2 g menadione, 200 mg iodine, 90 g iron, 20 g manganese, 10 g copper, 90 g zinc and 100 mg selenium per ton of feed.
[c]10g Aureomycin per lb.

corn-soybean meal diet; (2) a control hard red winter wheat-soybean meal diet; (3) a hard red winter wheat-soybean meal diet with a dry fat product added at a level to provide metabolizable energy levels equivalent to the calculated metabolizable energy level in the corn based diet; (4) a hard red winter wheat-soybean meal diet with fat added at a level of 5 percent of the diet. NRC (1979) metabolizable energy values were used for wheat and corn. A metabolizable energy value of 1475 and 3206 kcal per pound was used for soybean meal and dry fat, respectively.

Results and Discussion

During the growing period (Table 2), pigs fed a wheat-soybean meal based diet (treatment 2) grew 8 percent slower (P<.05) than those fed the corn-soybean meal diet (treatment 1). Addition of fat at a level to produce a diet equivalent in energy with the corn-soybean meal diet failed to improve gain over that observed for pigs fed the wheat-soybean meal diet (treatment 2 vs. treatment 3). Addition of fat at the 5 percent level (treatment 4), however, improved average daily gain 6 percent (P<.05) when compared to pigs fed the wheat-soybean meal control diet (treatment 2) and resulted in gains similar to those observed in pigs fed the corn-soybean meal diet (treatment 1). Feed efficiency was similar in pigs fed the corn-soybean meal diet and the wheat-soybean meal diets (treatments 1 and 2). Addition of 5 percent fat (treatment 4) improved feed efficiency by 6 percent (P<.05) when compared to pigs fed the wheat control diet or the wheat-soybean meal diet with 1.5 percent added fat (treatment 2 and 3, respectively). Differences in feed intake were not significant.

During the finishing phase (Table 3), pigs fed the wheat based diet (treatment 2) grew 4 percent slower (P<.05) than those fed the corn based diet (treatment 1). Addition of fat to provide an energy level equivalent to that in pigs fed the corn based diet (treatment 3) or at a level of 5 percent of the diet (treatment 4) improved average daily gain

Table 2. The effect of fat on performance of growing swine (43-121 lb.).

	Treatments			
	1 Corn-soy	2 Wheat-soy	3 Wheat-soy + 1.5% fat	4 Wheat-soy + 5% fat
Pigs/treatment, no.	102	105	95	96
Pens/treatment, no.	7	7	6	6
Avg. initial wt.,lb.	42.2	43.3	41.2	44.1
avg. final wt.,lb.	120.8	119.7	117.8	124.4
Avg. daily gain, lb.	1.78[a]	1.63[b]	1.64[b]	1.72[a]
Avg. daily feed intake, lb.	4.70	4.35	4.37	4.31
Feed/lb. gain, lb.[c]	2.65[ab]	2.69[a]	2.69[a]	2.52[b]

[a,b] Means in the same row with a different superscript differ (P<.05).
[c] Treatment 1 and treatment 4 differ (P<.07).

Table 3. Effect of fat on performance of finishing swine (123 lbs. to market).

	Treatments			
	1 Corn-soy	2 Wheat-soy	3 Wheat-soy + 1.5% fat	4 Wheat-soy + 5% fat
Pigs/treatment, no.	102	102	94	96
Pens/treatment, no.	7	7	6	6
Avg initial wt.,lb.	120.8	119.7	117.8	124.4
Avg final wt., lb.	222.4	223.5	226.7	229.7
Avg daily gain, lb.	2.04[a]	1.96[b]	2.02[ab]	2.06[a]
Avg daily feed intake,lb.[c]	6.90[a]	6.65[ab]	6.48[ab]	6.37[b]
Feed/lb. gain, lb.[d]	3.47[a]	3.52[a]	3.30[b]	3.17[b]
Adj. backfat, in.	1.23[ab]	1.21[a]	1.23[ab]	1.25[b]

a,b - Means in the same row with a different superscript differ (P<.05).
c - Treatment 1 and treatment 3 differ (P<.08).
d - Treatment 3 and treatment 4 differ (P<.09).

to levels similar to gains observed in pigs fed the corn-soybean meal control diet (treatment 1). Average daily feed intake was lower (P<.05) in pigs fed the diet with 5 percent added fat (treatment 4) when compared to pigs fed the corn-soybean meal control diet (treatment 1). Addition of 1.5% fat (treatment 3) tended (P<.08) to reduce feed intake when compared to intake of pigs fed the corn control diet (treatment 1). As was observed in the growing phase, feed efficiency was similar between pigs fed the corn-soybean meal control diet (treatment 1) or the wheat soybean meal control diet (treatment 2). Addition of fat to the wheat-soybean meal diet (treatment 2) to provide a calculated metabolizable energy level equivalent to that of pigs fed the corn-soybean meal diet (treatment 3) improved feed efficiency by 5 percent (P<.05). Addition of fat at the 5 percent level (treatment 4) resulted in an additional improvement in feed efficiency (treatment 3 vs. treatment 4; P<.09) resulting in a total improvement in efficiency of feed utilization of 8.6% (treatment 2 vs treatment 4; P<.05). Adding fat at the 5 percent level, but not the 1.5% level increased backfat (P<.05).

This study suggest that adding fat to swine rations to provide calculated metabolizable energy levels equivalent to those in swine fed a corn-soybean meal diet (1.5% fat) had no effect on gain or feed efficiency during the growing period (43 lbs. to 121 lb.). However, during the finishing period (121-225 lbs.) the addition of 1.5 percent fat resulted in improved average daily gain and feed efficiency. The improvement in feed efficiency during the finishing phase was greater than one would expect based upon the calculated metabolizable energy of the diet suggesting that the metabolizable energy estimates for wheat during the finishing phase may be low or the addition of fat may result in a decrease in feed wastage. This is consistent with the improved feed efficiency and a trend for a reduced feed intake in finishing swine fed the wheat based diet containing 1.5% fat when compared to those fed the corn based diet. The addition of 5 percent fat in both the growing

and finishing period resulted in an improvement in average daily gain and feed efficiency when compared to pigs fed a wheat-soybean meal diet without added fat. Although a significant increase in backfat was observed in pigs fed the wheat based diet with 5 percent fat (treatment 4) when compared to pigs fed the wheat control diet with no added fat (treatment 2), it should be noted that this increase was small and resulted in a backfat thickness similar to that observed in pigs fed the corn control diet (treatment 1). Additional studies are needed to determine why small amounts of added fat may result in improvement in performance of finishing but not growing swine fed wheat based diets.

Literature Cited

NRC. 1979. Nutrient Requirements of Swine. National Academy of Sciences, Washington, D.C.