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Swine Diets Utilizing Wheat

J. W. McCarty, R. C. Wahlstrom and A. E. Dittman

The practicality of using wheat in diets for growing-finishing swine has been the subject of a series of trials conducted at the Experiment Station's North Central Substation, Eureka, South Dakota.

Corn based diets for swine are considered the standard for comparison. But there are times, such as the availability of different grains or their relative prices, when attempting to take advantage of the greater protein content of wheat seems desirable. Corn and wheat are about equal in energy value, digestibility and palatability.

Previous trials have suggested that, when diets were supplemented at the same level and either corn or wheat was used in the same amount as the grain, pig gains were similar. However, pigs fed corn diets were more efficient in terms of both feed use and cost per pound of gain. Wheat diets supplemented at lower levels to assess the value of wheat's higher protein level relative to corn and fed with or without supplemental lysine did not support satisfactory pig performance in terms of gain, feed efficiency or feed cost. Results of these trials suggested that an intermediate level of protein supplementation for wheat should be investigated. The trial reported here was designed with that objective.

Procedures

Experimental animals were 120 rotation-breed-cross barrows and gilts. All pigs were by the same sire and were allotted to represent litters, sexes and weight. Test groups included 15 pigs each allotted to four treatments in two replicates. Pigs were grown out in one-half acre grass-alfalfa pasture lots. Each lot was equipped with a portable shelter, a self-feeder and an automatic watering fountain.

Diet treatments were as outlined below:

1. Corn-high protein, control
2. Wheat, high protein
3. Wheat, medium protein
4. Wheat, low protein

All diets (composition shown in table 1) were ground mixtures of grain, protein and supplements which contained similar levels of minerals, vitamins and antibiotics. All diets were self-fed.

At average lot weights of approximately 125 lb. grower diets were replaced by finisher diets, the latter being fed until pigs reached final weights of 205 lb. minimum for barrows and near 200 lb. for gilts. At final weights barrows were trucked 160 miles to a packing plant for the collection of carcass information. Live backfat measurements were made on all gilts.

Results and Discussion

Performance results for this trial are summarized in tables 2 and 3. Data are shown by treatment rather than lot since the two replicates of each treatment indicated a similar response to the treatments imposed. Table 2 includes information for pig gains and for feed use and cost. Table 3 includes carcass information.

In this trial the control corn diet supported the most efficient performance in terms of gains and feed use and cost for the entire growing-finishing period. Rather unexpectedly pigs fed the wheat-medium level protein diet gained almost as rapidly but not as efficiently as pigs fed the control diet. As compared to controls, the pigs fed wheat-high protein and wheat-low protein diets gained 7 and 9% less rapidly, respectively, for the trial. Feed use for these same two treatments was 9 and 11.5% greater, respectively, than for control diet-fed pigs. Feed costs were consistent with these differences in gain and feed efficiency.

It is interesting to note that during the grower period daily gains were essentially the same for all treatments. During this period pigs fed the wheat-medium protein diet were more efficient than pigs on other treatments, and cost per pound of gain was the least. Of the four treatments the wheat-low protein was clearly least desirable in terms of feed use and cost. This treatment appears uneconomical given a choice of diet ingredients.

Differences among treatments were most striking for the finisher period. Only control pigs gained more rapidly during this period as would usually be expected. The wheat-high protein diet, which differed from the control diet with the equal substitution of wheat for corn, proved less desirable for the finishing period. Therefore the relatively good finisher performance of wheat-medium protein fed pigs was surprising. The data suggest no basis for this contradiction. These data are not entirely consistent with some reports that continuing pigs on high levels of wheat in the diet during the finishing period results in less desirable performance.

Carcass data (table 3) suggest that there were no important influences of the treatments on carcass traits in this trial. Final age differences are largely a reflection of differences in daily gain among the treatments. Sampling error appears largely responsible for the larger loin eye areas of the pigs fed the wheat-medium protein diet. Carcass backfat and loin eye area measurements were uniformly undesirable for all treatments and likely not the result of treatments.

Conclusions

In terms of gain and the cost of producing it, this trial reaffirms the efficiency of adequately supplemented corn diets for growing-finishing pigs. The results do not argue against the use of wheat in swine diets, but the relative amount of wheat in the diet and the supplementation used, particularly in the finishing period, needs attention. The use of wheat or corn will depend on their relative availability and prices.

Table 1. Composition of Experimental Diets
(For 1,000 lb. of Complete Ground Mixture)

Ingredients	Treatment							
	1		2		3		4	
	Grower	Finisher	Grower	Finisher	Grower	Finisher	Grower	Finisher
Shelled corn	797	885	--	--	--	--	--	--
Wheat	--	--	797	885	842	930	884	975
Soybean oil meal (44%)	178	92	178	92	133	46	90	--
Dicalcium phosphate	10	9	10	9	10	10	11	11
Ground limestone	8	7	8	7	8	7	8	7
Trace mineral salt (0.8 to 1.0% zinc)	5	5	5	5	5	5	5	5
Vitamin-antibiotic premix ^a	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Chemical analyses ^b								
Protein, %	16.99		20.53		19.21		17.81	
Calcium, %	0.78		0.63		0.69		0.55	
Phosphorus, %	0.59		0.63		0.58		0.63	

^a Each pound of premix provided: 2 gm. oxytetracycline, 600,000 U.S.P. units vitamin A, 60 I.U. vitamin D₃, 400 mg. riboflavin, 1,000 mg. d-pantothenic acid, 3,000 mg. niacin, 23,044 mg. choline chloride, and 3 mg. vitamin B₁₂ activity.

^b Chemical analyses of finisher rations not completed in time for inclusion in this report.

Table 2. Performance Summary for Pigs Fed Corn or Wheat Growing Diets

	Corn (control)	Wheat Diets		
		High protein	Medium protein	Low protein
Number of pigs	30	28 ^a	30	30
Average initial weight, lb.	59.4	59.2	58.9	59.8
Average pig weight, lb.				
End of grower period	125.8	124.6	125.9	123.7
End of trial	208.8	209.6	208.2	209.2
Average daily gain, lb.				
Grower period	1.58	1.56	1.59	1.52
Finisher period	1.66	1.48	1.58	1.42
Entire trial	1.62	1.51	1.59	1.46
Average daily feed consumption, lb.				
Grower	4.21	4.10	4.07	4.48
Finisher	5.79	5.85	6.03	5.79
Total	5.05	5.11	5.16	5.25
Feed per pound gain, lb.				
Grower period	2.67	2.63	2.55	2.95
Finisher period	3.49	3.95	3.82	4.07
Total	3.11	3.38	3.25	3.59
Feed cost per pound of gain, cents ^b				
Grower	9.2	9.3	8.7	9.6
Finisher	11.1	12.9	12.0	12.2
Total	10.4	11.7	10.8	11.3
Feed cost per ton, dollars				
Grower	68.51	70.10	67.41	66.89
Finisher	63.13	64.90	62.20	59.51

^a One pig died in each lot on the 76th day of the trial. The cause was probably very warm weather.

^b Total feed costs are based on the following ingredient and processing prices: Corn, \$2.50/cwt. (\$1.40/bu.); wheat, \$2.60/cwt. (\$1.56/bu.); soybean oil meal, \$5.60/cwt.; dicalcium phosphate, \$5.70/cwt.; ground limestone, \$1.80/cwt.; trace mineral salt (high zinc) \$3.00/cwt.; vitamin-antibiotic premix, \$0.50/lb.; grinding, \$2.50/ton; mixing, \$2.00/ton.

Table 3. Carcass Data Summary

Treatments	Corn (control)	High protein	Wheat diets	
			Medium protein	Low protein
Number carcasses	12	14	14	16
Final age, days	153	159	154	163
Final weight, lb.	219	218	215	216
Cold carcass weight, lb.	160	157	154	157
Carcass length, inches	30.1	30.0	29.8	30.1
Carcass backfat, inches	1.69	1.68	1.69	1.63
Loin eye area, sq. in.	4.07	4.06	4.42	3.99
Ham and loin, %	42.6	42.6	42.5	42.5
Lean cuts, %	58.6	58.8	58.7	59.1

Carcass data were available through the cooperation of Armour and Co., Huron, South Dakota.