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Wheat in Swine Finishing Rations

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

Wheat, because of its relatively high protein content as compared to other cereal grains, is attractive as the grain in rations for growing-finishing swine. As compared to corn, wheat is approximately equal in energy value, digestibility and palatability. Like corn, wheat is also deficient in specific amino acids, notably lysine.

The objectives of the trial reported here were:

1. To compare the performance of pigs fed rations with the same proportions of grain and supplement but with the grain corn in one ration and wheat in another ration.
2. To assess the possible feeding value of wheat's greater protein content by use of an all wheat ration in which there was a lower level of supplemental protein.
3. To assess the value of lysine in wheat rations by the addition of lysine to the same ration as used for comparison 2 (above).

Experimental Procedures

One hundred twenty-eight crossbred barrows and gilts, all by one sire, were allotted to two replicates of four treatments on the basis of litter, sex and weight. Each of the 16-pig groups was grown out in grass-alfalfa pasture lots approximately one-half acre in size. Equipment in each lot included a portable shelter, self-feeder and automatic watering fountain.

Experimental rations (composition is shown in table 1) were self-fed. These rations were all ground mixtures of grain, protein and supplements containing similar levels of minerals, vitamins and antibiotic. They represented the following ration treatments:

1. Corn, control
2. Wheat, high protein
3. Wheat, low protein
4. Wheat, low protein and supplemental lysine

Grower rations were fed until pigs within lots averaged approximately 125 lb., and finisher rations were fed from 125 lb. to final weights.

Barrows were removed from the experiment at weights not less than 205 lb. and trucked 160 miles to a packing plant where carcass data were collected. Gilts were removed and live backfat probes taken at weights near 200 lb.

Results and Discussion

Performance data for this trial have been summarized for pig gains and feed use, efficiency and costs in table 2 and for carcass data in table 3.

These data show that the control corn ration (treatment 1) produced greater daily gains, with more efficient feed use, and at a lower cost per unit of gain than was true for any of the all-wheat rations (treatments 2, 3 and 4). Barrow carcass data do not indicate any clear differential results due to treatment, except that carcasses for control pigs tended to have somewhat more backfat than for pigs on other treatments.

Wheat or Corn

Treatments 1 and 2 differed only in the grain portion of the rations. Based on calculated analysis for protein, the wheat ration contained 3% more crude protein than the corn ration. Pigs fed wheat gained slightly less rapidly than those fed corn but were 8.6% less efficient in feed use. The price differential between corn and wheat was great enough that feed costs for the wheat ration were almost two cents per pound of gain greater than for the corn ration. Clearly, consideration of crude protein content alone is not sufficient when comparing these two rations which were supplemented equally.

Consideration of treatment 3 as compared to either treatment 1 or 2 in this trial demonstrates further that crude protein content is not the best measure of ration feeding value. Based on calculated crude protein, the control corn ration and treatment 3 were similar nutritionally. However, pigs on treatment 3 gained 9% less rapidly and were 17% less efficient than the control pigs. Feed costs were proportionately greater for treatment 3 pigs.

Wheat With Added Lysine

Wheat is known to be deficient particularly in the essential amino acid lysine. The relative importance of lysine is demonstrated by treatment 4. Treatments 3 and 4 differed only in the addition of lysine for treatment 4. Pigs on this treatment performed at a somewhat higher level in all respects than those on treatment 3. Additional lysine improved both gains and feed efficiency but at a cost per pound of gain greater than when wheat was used as the grain in treatment 2. These treatment comparisons indicate that lysine was limiting in the rations used, but other nutrient constituents or amino acid balance may be also involved.

Summary

Based on the treatments imposed in this trial, pigs self-fed a supplemented corn ration gained more rapidly, with greater feed efficiency, and at less cost than pigs on three other rations using wheat as the grain. Substituting wheat for corn--with each ration supplemented the same--produced similar pig gains, but feed efficiency and costs were less desirable than for pigs on the corn rations.

Wheat rations formulated to have protein contents similar to corn rations resulted in less desirable overall pig performance than for the control corn ration. Daily gains were similar but not feed efficiency. The price differential between corn and wheat was too great for economical use of wheat as the grain.

Supplemental lysine at the level used in this trial was not sufficient to produce pig performance equal to that using corn rations.

Barrow carcass data showed little evidence of influence from ration treatment with the possible exception that those fed the corn rations tended to have somewhat more backfat than was true for the other treatments.

Table 1. Composition of Experimental Rations
(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	884	975	884	975
Soybean oil meal (44%)	178	92	178	92	90	--	90	--
Dicalcium phosphate	10	9	10	9	11	11	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
Lysine (50%)	--	--	--	--	--	--	4.0	4.0
Calculated protein content, %	15.0	12.0	17.4	14.6	14.6	11.7	14.6	11.7
Chemical analyses								
Protein, %	16.06	12.75	19.68	17.25	17.31	15.62	17.87	16.47
Calcium, %	0.55	0.50	0.55	0.47	0.53	0.47	0.62	0.56
Phosphorus, %	0.49	0.42	0.61	0.59	0.61	0.64	0.61	0.59

^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.

Table 2. Performance Summary for Pigs Fed Corn or Wheat Growing-Finishing Rations

Treatment	1		Wheat rations				4	
	Corn (control)		High protein		Low protein		Low protein, lysine added	
Lot number	1	5	2	8	3	7	4	6
Number pigs	16	16	16	16	16	16	16	16
Avg. initial weight, lb.	66	66	67	65	66	67	68	67
Avg. final weight, lb.	208	213	208	209	216	209	212	211
Avg. daily gain, lb.	1.86	1.89	1.83	1.81	1.73	1.70	1.74	1.80
Feed required per lb. gain, lb.	2.73	2.64	2.88	2.94	3.07	3.42	3.08	2.90
Avg. daily feed consumption, lb.	5.07	5.00	5.26	5.32	5.31	5.82	5.36	5.27
Feed cost per lb. gain, cents	8.1	7.8	9.8	10.0	9.8	11.0	10.5	9.9
Feed cost/ton feed, \$ ^a								
Grower	62.92		71.53		67.04		71.04	
Finisher	57.79		66.35		62.67		66.67	

^a Total feed costs are based on the following ingredient prices: Corn, \$2.25/cwt. (\$1.26/bu.); wheat, \$2.79/cwt. (\$1.67/bu.); soybean oil meal, \$5.30/cwt.; dicalcium phosphate, \$5.20/cwt.; ground limestone, \$1.45/cwt.; trace mineral salt, \$2.65/cwt.; vitamin-antibiotic premix, \$0.42/lb.; lysine, \$1.00/lb.; grinding, \$2.50/ton; and mixing, \$2.05/ton.

Table 3. Carcass Data Summary for Pigs Fed Corn or Wheat Growing-Finishing Rations

Treatment	1		Wheat rations				4	
	Corn (control)		High protein		Low protein		Low protein, lysine added	
Lot number	1	5	2	8	3	7	4	6
Number carcasses	8	8	8	8	8	8	8	8
Final age, days	147	146	146	151	156	152	153	149
Final weight, lb.	214	221	217	220	226	218	219	223
Cold carcass weight, lb.	156	162	152	156	160	156	157	158
Carcass:length, in.	29.8	29.6	30.2	31.3	30.7	29.8	29.9	30.1
Carcass:backfat, in.	1.53	1.52	1.37	1.44	1.39	1.46	1.44	1.45
Loin eye area, sq. in.	5.17	4.65	5.08	4.63	4.69	4.60	5.18	4.77
Percent ham and loin	42.6	42.7	45.3	43.4	43.1	42.2	44.0	43.1
Percent lean cuts	60.0	59.7	62.8	60.6	60.7	59.3	61.5	60.5