

Evaluation of Wheat in Rations for Growing-finishing Swine
(Project 110)

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A series of experiments has further evaluated wheat as swine feed. The experiments were conducted in confinement on concrete floored pens. Purebred Duroc, Poland and D x P crossbred pigs were used in all trials. All rations were supplemented with calcium, phosphorus, salt, trace minerals, the following vitamins A, D, riboflavin, pantothenic acid, niacin, choline, B₁₂ and antibiotic, chlortetracycline. Soybean oil meal was added to the grain to bring protein content to the desired level.

A. Comparing wheat, sorghum grain and corn to finish swine.

The test was from March 30 to May 6, 1965. Six pigs were fed in each lot with two lots per treatment. Results are shown in Table 52.

Rations were calculated to contain 12% crude protein and so no soybean oil meal was needed. Chemical analysis showed the rations to be higher in protein than calculated. The wheat ration contained 15.7% crude protein, but pigs on it gained significantly more slowly than pigs on either corn or sorghum grain rations, indicating a probable imbalance of amino acids in the protein from wheat. Pigs fed either sorghum grain or corn gained at the same rate, however, those fed sorghum grain were more efficient. Pigs fed wheat had the lowest feed intake and the least efficient gains.

Table 52
Comparison of Wheat, Sorghum Grain and Corn to Finish Swine
March 30 - May 5, 1965.

Ration No.	S73	S76I	S77
Grain	Sorghum	Wheat	Corn
% protein*	13.8	15.7	13.0
No. of pigs	12	12	12
Initial wt.	123	123	123
Final wt.	188	171	189
A.D.G.	1.78**	1.29	1.77**
Feed/hd/day	5.85	5.04	6.47
Feed/lb. gain	3.29	3.99	3.66

* Chemical analysis.

** Statistically significant ($P < .01$)

B. Comparing four cereal grains for growing-finishing swine.

First of three phases of the study was conducted during the growing period; the other two phases, during the finishing period. During the finishing period half the pigs were continued on rations containing the same level of protein. The other half's rations corn was replaced by the other grains pound for pound. During each phase there were two lots per treatment with varying numbers per lot. All rations were pelleted. Sorghum grain, corn, barley and wheat were the cereal grains tested.

Table 53 gives results of growing and finishing phases. Pigs fed sorghum grain or barley gained at the same rate and more rapidly than those fed corn or wheat. Pigs fed corn gained slightly faster than those fed wheat. Amount of feed eaten was closely related to rate of gain, with very little difference in efficiency of gains from various rations. Pigs fed corn ration made the fastest and most efficient gains during the finishing phase. Pigs on wheat gained more slowly and ate less than pigs on other rations. Pigs fed barley gained least efficiently.

The remaining half of the pigs from the growing phase plus additional pigs were used to evaluate grains in rations formulated to contain 12% crude protein from corn and soybean oil meal or with replacing corn and remaining ingredients unchanged. Pigs fed wheat performed much better than they did in the equal-protein comparisons. These results substantiate the previous test that wheat alone has an imbalance of amino acids. Amino acids must be added from other sources, like soybean oil.

Table 53

Four Cereal Grains for Growing-finishing Swine Compared.
 Growing phase: April 14 - May 25, 1965 - 16% protein*

Grain	Corn	Sorghum	Wheat	Barley
Ration No.	S78	S78A	S78B	S78C
% protein**	17.0	16.9	19.3	17.8
No. of pigs	16	16	16	16
Initial wt.	47.4	47.8	47.8	47.8
Final wt.	104	110	101	110
A.D.G.	1.38	1.53	1.31	1.53
Av. daily feed	3.34	3.75	3.24	3.68
Feed/lb. gain	2.42	2.44	2.53	2.41

Finish phase May 25-July 13, 1965 - 12% Protein*

Ration No.	S78E	S73	S78F	S78G
% protein**	12.9	13.1	13.3	13.6
No. of pigs	8	8	8	8
Final wt.	196	201	182	195
A.D.G.	1.91	1.78	1.61	1.73
Av. daily feed	6.2	6.1	5.3	6.5
Feed/lb. gain	3.26	3.42	3.3	3.72

Finishing phase: corn-replaced pound for pound

Ration No.	S78E	S78H	S78I	S78J
% protein**	12.9	14.2	16.4	16.2
Final wt.	196	189	180	188
A.D.G.	1.87	1.76	1.72	1.75
Av. daily feed	5.6	5.3	5.2	6.1
Feed/lb. gain	3.00	3.03	3.01	3.51

* Calculated to contain 16 and 12 percent protein for growing and finishing phases.

** By chemical analysis.

C. Wheat and sorghum grain for growing-finishing swine compared.

Sorghum grain was compared with wheat and various combinations of the two grains. Although sorghum grain and wheat generally contain more protein than corn, previous work had indicated more protein was needed with sorghum grain and wheat. For this study, protein values of 9 and 10.5 percent, respectively, were used for the sorghum grain and wheat. Protein level was reduced when the pigs weighed 135 pounds.

Results are shown in Table 54. Pigs fed sorghum grain as the only grain made the fastest and most efficient gains, and those fed wheat made the slowest gains. Gains of pigs fed various proportions of sorghum grain and wheat were between gains from one of the grains. No consistent pattern indicated that as more wheat was added, gains decline. As in earlier trials, pigs fed the all-wheat ration consumed less feed than those on other rations. Apparently that is the main factor that limits performance of pigs on wheat rations. Efficiency of wheat rations has been excellent, not enough wheat is eaten to produce gains like those from corn and grain sorghum.

Table 54

Sorghum Grain, Wheat and Various Combinations of Them for Growing-finishing Swine Compared.

Ration No.*	S83D-I	S83-E	S83A-F	S83B-G	S83C-H
Ratio -- Sorghum:wheat	1:0	2:1	1:1	1:2	0:1
No. pigs	18	18	18	18	18
Initial wt.	71	71	71	70	71
Final wt.	204	201	199	203	198
Av. daily gain	1.71	1.63	1.60	1.68	1.59
Av. daily feed	5.47	5.30	5.27	5.47	5.14
Feed/lb. gain	3.21	3.28	3.31	3.27	3.24

* Protein content was reduced when pigs weighed approximately 135 pounds.

D. Effect of physical form of wheat on performance of growing-finishing swine.

Since feed intake of wheat rations by swine appears to limit maximum gains, two trials were conducted to study the effect the final physical form of a ration might have on growing-finishing swine performance.

Wheat ground through a 1/8-inch screen in a hammer mill was fed as a meal, pellet or crumble (Table 55). Two lots of nine pigs each were fed each ration. Differences in the gains were small. Pigs fed the pelleted ration ate less and gained most efficiently.

Table 55

Effect of Physical Form of Wheat Rations for Growing-finishing Swine.

Form	Meal	Pellet	Crumble
No. of pigs	18	18	17
Initial wt.	34.5	34.7	34.7
Final wt.	167	170	178
A.D.G.	1.27	1.30	1.32
Daily feed	4.08	3.82	4.01
Feed/lb. gain	3.21	2.94	3.07

In the second trial, wheat was prepared by coarsely rolling and finely grinding (1/8-inch screen) in a hammer mill. Finely ground feed was fed in both meal and pellet form. In addition, 5% of wheat bran was added to the finely ground wheat and then pelleted, in an attempt to soften the pellet.

Two lots of six pigs each were fed each ration from 36 to 115 pounds (Table 56). Pigs fed the finely ground wheat in meal form gained faster, consumed more feed and were as efficient as pigs on other rations. Adding 5% bran did not improve palatability, as less of that ration than any other was consumed and pigs on it gained more slowly than pigs on other rations. Pigs fed the coarsely rolled wheat ration gained slightly faster than those fed the ration with the added bran, but they gained less efficiently.

To test palatability, three pens of 11 pigs each were offered a choice between coarsely rolled wheat ration and another ration (Table 57). Pigs chose coarse rolled wheat over finely ground meal, about 2½ to 1, which does not agree with performance of the pigs in the growth study previously discussed. The finely ground wheat ration in pelleted form was preferred by about a 3 to 1 ratio over coarsely rolled wheat. With no choice (previous trial) the two rations were consumed at about the same level. Pigs fed finely ground wheat plus 5% of bran pelleted preferred it about 9 to 1 over coarsely rolled wheat which does not agree with above data, showing that less pelleted ration than any other was consumed when no choice was available. Further work on wheat rations for swine is needed.

Table 56

Effect of Method of Preparation and Physical Form of Wheat Rations on Performance of Growing-finishing Swine

Ration	Rolled	Fine meal	Fine Pelleted	+5% Bran Pellet
No. pigs	10*	12	12	12
Initial wt.	37.8	36.6	36.3	36.8
Final wt.	113	129	119	106
Daily gain	1.07	1.32	1.17	1.00
Daily feed	3.9	4.3	3.85	3.35
Feed/lb. gain	3.6	3.3	3.25	3.4

* Two pigs removed - data not included

Table 57

Preference by Pigs for Wheat Ration in Various Forms. Pounds Consumed by 2-week Intervals.

Pen*	1		2		3	
	Rolled	Fine Meal	Rolled	Pellet	Rolled	5% Bran Pellet
1st 2 weeks	268	75	24	354	17	342
2nd 2 weeks	271	127	39	358	39	359
3rd 2 weeks	479	174	251	295	84	516
Total	1018	376	314	1007	140	1217

* 11 pigs per pen.