

Levels of Barley

in Rations for

Growing Pigs

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Swine production and the feeding of barley-based rations are profit-maximizing "naturals" for North Dakota farmers. A recent analysis of farm organization in the Red River Valley with the objective of maximizing the return to resources (Anderson and Johnson, North Dakota A.E.S. Bulletin 489, 1971) indicated that swine production was one of the keys to maximizing returns on the farms analyzed. Similarly, evaluating the cost of feedstuffs and their nutritive content indicates that North Dakota swine producers should utilize the maximum amounts of barley and oats possible in balanced swine rations as a means of reducing feed costs.

Relatively little has been known concerning the ability of the young pig to utilize fibrous feeds, such as barley and oats, during the early growing period from 25 to 50 pounds. Young pigs are generally considered to have a requirement for moderately high energy feedstuffs such as corn or wheat. Because of the high fiber and lower energy content of oats, barley would be more acceptable than oats in rations for young pigs. Oats are well utilized by older swine and are particularly useful in rations fed to the swine breeding herd.

A series of experiments was conducted to evaluate the ability of the young pig to utilize various levels of barley in pelleted rations and to determine the optimum level of barley in rations for pigs between approximately 25 and 50 pounds.

Experimental Procedure

Three experiments, each of which was of 21 days duration, were conducted with pigs having an average initial weight of approximately 25 pounds. Barley was fed at levels of 0, 20, 40 or 81.7 percent of the total ration and replaced corn and small amounts of soybean meal. All rations (Table 1) were formulated to contain 18 percent crude protein and were pelleted. Pigs were weighed at weekly intervals, but only the data for the complete experiment

were submitted for statistical analysis. Six or seven pigs of similar initial weight were allotted per pen. Feed and fresh water were available at all times.

Table 1. Composition of Rations for Growing Pigs.

INGREDIENT:	% Barley in Ration			
	0	20	40	81.7
Barley	—	20.0	40.0	81.7
Corn	75.7	57.4	39.0	—
Soybean meal	17.0	15.3	13.7	11.0
Fish meal	5.0	5.0	5.0	5.0
Dicalcium phosphate	1.6	1.6	1.6	1.6
Salt, trace mineralized	0.5	0.5	0.5	0.5
Vitamin premix	0.2	0.2	0.2	0.2
Zinc sulfate	+	+	+	+
Cost per ton ¹	\$79.99	\$77.08	\$74.20	\$68.37

¹ Includes the following costs, per ton unless specified otherwise: corn, \$50.00; barley, \$38.00; soybean meal, \$80.00; fish meal, \$210.00; dicalcium phosphate, \$96.00; salt, \$2.50/cwt; vitamin premix, \$2.00 per lb.; grinding, mixing and pelleting, \$10.00/ton.

Results and Discussion

The results of the three experiments (Tables 2, 3 and 4) indicated that quite acceptable results were obtained with all rations in each experiment.

Table 2. Results of Experiment I.

ITEM:	% Barley in Ration			
	0	20	40	81.7
No. of pigs	24	24	24	24
Av. initial wt., lb.	26.2	26.4	26.3	26.3
Av. final wt., lb.	50.5	50.0	50.6	50.4
Av. daily gain, lb.	1.16	1.11	1.16	1.14
Av. daily feed, lb.	2.15	2.15	2.26	2.32
Av. feed/gain, lb.	1.86	1.94	1.96	2.04

Table 3. Results of Experiment II.

ITEM:	% Barley in Ration			
	0	20	40	81.7
No. of pigs	33	31 ¹	33	33
Av. initial wt., lb.	22.9	23.0	22.8	23.3
Av. final wt., lb.	42.4	40.0	41.3	40.8
Av. daily gain, lb.	0.90	0.81*	0.88	0.83
Av. daily feed, lb.	1.88	1.75	1.89	1.86
Av. feed/gain, lb.	2.09	2.16	2.16	2.23

¹ Two pigs removed for reasons not related to experimental treatment

* Average daily gain significantly less than that of 0% barley treatment (P less than .05).

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Table 4. Results of Experiment III.

ITEM:	% Barley in Ration			
	0	20	40	81.7
No. of pigs	12	12	12	12
Av. initial wt., lb.	24.1	24.1	24.3	24.3
Av. final wt., lb.	43.7	43.8	43.4	42.8
Av. daily gain, lb.	0.94	0.94	0.91	0.88
Av. daily feed, lb.	2.09	1.98	1.93	1.97
Av. feed/gain, lb.	2.23	2.11	2.12	2.24

A statistically significant ($P < .05$) difference in average daily weight gain was noted only in experiment II, when feeding the ration containing 20 percent barley resulted in lower weight gains than when the ration containing no barley was fed. The corn-soy-fish meal ration (no barley) represented the type of ration commonly fed in corn-producing areas and served as the treatment to which the other rations were compared.

Examination of the results of the individual experiments and the summary of all experiments (Table 5) indicates that rations containing 20, 40, or 81.7 percent barley produced results quite comparable to the corn-soy-fish meal ration. The differences noted in average daily gain and average daily feed consumption were minor in nature. As anticipated, feed per unit of weight gain was increased when rations containing barley were fed.

Table 5. Summary of Results and Costs.¹

ITEM:	0	20	40	81.7
No. of pigs	67	67	69	69
Av. initial wt., lb.	24.3	24.4	24.3	24.5
Av. final wt., lb.	45.3	44.26	44.9	44.5
Av. daily gain, lb.	1.00	0.94	0.98	0.95
Av. daily feed, lb.	2.01	1.93	2.03	2.04
Av. feed/gain, lb.	2.03	2.09	2.08	2.17
Total wt. gain, lb.	1448	1330	1423	1378
Av. feed/pig, lb.	42.2	40.5	42.6	42.8
Total feed, lb.	2912	2716	2941	2956
Total feed cost	\$116.47	\$104.67	\$109.11	\$101.08
Feed cost/lb. gain, cents	8.0	7.9	7.7	7.3

¹ Calculation of certain values from other values may not result in figures presented because of rounding. All values are weighted averages.

This had been expected because the total digestible nutrient (TDN) content of barley is less than that of corn. If the TDN content of corn is assumed to have been 80 percent, it can be calculated that the average TDN content of the barley fed in these experiments was 73.5 percent for growing pigs from 25 to 50 pounds. This calculation assumes that equal amounts of energy (TDN) are required per pound of weight gain. This assumption should be satisfied, as the weights of all groups of pigs were similar and any potential error associated with maintenance due to dissimilar weights may be disregarded.

These experiments have demonstrated that corn need not be a component of rations for pigs weighing 25 to 50 pounds and that barley is a perfectly acceptable ingredient in pelleted rations for pigs in this weight range. This means that North Dakota pork producers who do not raise corn need not purchase corn for feeding pigs weighing 25 pounds or more.

On the other hand, North Dakotans who can raise corn might consider selling their corn and buying barley because of the current relative prices of the two grains. This practice would be advantageous only when the TDN in the corn grown could be exchanged for a larger amount of TDN in the form of barley. Using the TDN assumptions listed previously, one bushel of corn (56 lb. per bushel) contains the same amount of TDN as 1.25 bushels of barley (48 lb. per bushel). If sold on a hundred-weight basis, 109 pounds of barley would equal 100 pounds of corn in terms of equal amounts of TDN or energy.

Although weight gained was slightly greater when corn was the only cereal grain in the ration, the most economical weight gain was obtained with the ration in which barley was the only cereal grain (Table 5). The result was obtained because of the current price differential between corn and barley as well as the higher protein content of the barley, which reduced the amount of soybean meal needed to produce rations containing 18 percent crude protein. The level of fish meal was not reduced, although fish meal is very expensive, because this source of animal protein provides amino acids which could possibly be limiting for the young pig if soybean meal had been the sole source of supplemental protein.

Summary

Three experiments involving a total of 274 young pigs were conducted to determine the maximum level of barley that would produce rapid, economical weight gains in rations fed to pigs from approximately 25 to 50 pounds. It was demonstrated that barley can replace corn as the sole cereal grain in balanced, pelleted rations formulated to contain 18 percent crude protein in which the supplemental protein was provided by soybean meal and fish meal. The substitution of barley for all of the corn and a portion of the soybean meal resulted in a less expensive ration which produced the most economical weight gains. Calculations based upon the assumption that similar amounts of total digestible nutrients (TDN) were required per unit of gain indicated that the barley used in these experiments had a TDN content of approximately 73.5 percent for pigs between 25 and 50 pounds.