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Hard Wheat Compared to Soft Wheat  
For Finishing Swine

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Summary

Three feeding trials were conducted to compare soft winter wheat with hard winter wheat for finishing swine. In each trial, soft wheat diets supported weight gains and feed/gain ratio equal to those observed for pigs fed hard winter wheat diets. Both soft and hard wheat diets were compared with milo basal diets resulting in similar performances and reaffirming that wheat can replace all the milo in a swine diet. The study involving the method of processing the wheat diets indicated that rolled wheat diets resulted in pig performance superior to ground diets. Pelleting wheat diets was superior to both grinding and rolling as shown by performance. Soft wheat as well as hard wheat can be fed to finishing swine with only the addition of lysine. No soybean meal is needed since lysine is the only limiting amino acid in wheat-based finishing diets.

Introduction

Hard red winter wheat has been the traditional wheat crop in Kansas. Because of advantages in yield, livestock producers have looked toward soft winter wheat as a potential crop for livestock feed. Feeding trial comparisons of the two wheat types is very limited. Therefore, this series of feeding trials was conducted to evaluate growth and efficiency of finishing swine when fed hard or soft winter wheat as the main energy source.

Procedure

Trial 1. Fifty-four crossbred barrows and gilts averaging approximately 135 lbs were allotted to six replicates of three treatments. The finishing pigs were housed in a 4' x 12' concrete floored pen with an access to a one-hole self feeder and automatic waterer. The diets utilized in this study were formulated to have .60% lysine, .75% calcium, and .65% phosphorus. The feeding trial lasted 73 days with an average final weight of 266 lbs.

Trial 2. One hundred and forty-four crossbred barrows and gilts were allotted to two replicates of a 4 x 2 factorial experiment. The finishing pigs averaging 148 lbs were housed in the KSU finishing barn in pens (6' x 15') equipped with a two-hole self feeder and an automatic waterer. Pens have 100% concrete slats. Each pen was covered with a plywood hover over a 6' x 8' area. The processing methods evaluated were as follows: (a) 3/16" grind, (b) 1/4" grind, (c) rolled, (d) pellet of 1/4" grind. The main energy source of the finishing diets were soft or hard winter wheat. The wheat diets consisted of 85.4% soft or hard wheat, 11% soybean meal (44%), 1.15% dicalcium phosphate, 1.15% ground limestone, and 1.3% vitamin, trace mineral, salt, and antibiotic mix. The calculated analysis of the diets was 15.7% crude protein, .60% lysine, .75% calcium, and .65% phosphorous. Feeding trial terminated after 48 days.

Trial 3. Eighty crossbred finishing pigs averaging 150 lbs were allotted to the following treatments: (a) milo-soybean meal diet, (b) hard winter wheat plus 0.25% L-lysine, (c) hard winter wheat plus 8.75% soybean meal (44% CP), (d) soft winter wheat plus 0.25% L-lysine, (e) soft winter wheat plus 8.75% soybean meal. The 8.75% soybean meal added .25% L-lysine to the diet so that all diets had a calculated lysine content of .60%. Composition of diets used in this study are shown in Table 5. The feeding trial terminated after 35 days.

### Results

Trial 1. Performance of finishing swine fed diets containing either milo, soft or hard wheat are shown in Table 1. Pigs fed either the hard or soft wheat gained at a similar rate as those fed the milo control diet. Feed to gain ratios were also similar indicating that wheat can replace all the milo in swine finishing diets. The soft and hard wheat diets resulted in pigs growing at similar rates with equal pounds of ration required per pound of gain. Feeding values of soft and hard wheat were equal in this trial.

Trial 2. Table 2 shows the performance of finishing swine as affected by method of processing soft or hard winter wheat diets. Growth and feed conversion did not differ between pigs consuming soft or hard wheat diets within each process. Table 3 shows the comparison of processing methods of wheat diets on performance. Those pigs receiving the pelleted diet grew significantly faster and more efficiently than pigs fed the ground diets. Pelleting also resulted in improved rate of gain and significantly improved feed efficiency as compared to those pigs fed the rolled diet. Rolled wheat diets improved weight gains and feed required per lb of gain when compared with pigs fed the ground diets. Fineness of grind resulted in similar performance as determined by average daily gain and feed/gain ratio. Table 4 presents the comparison of hard and soft wheat diets. Rate of gain, average daily feed intake, and feed conversion were equal for pigs receiving either the soft wheat or hard wheat diets.

Trial 3. Table 6 presents the performance of finishing pigs fed diets formulated to be equal in lysine content, utilizing three main energy sources (milo, hard wheat or soft wheat) and two sources of lysine (soybean meal or L-lysine HCL (78%). The average daily gain was similar for all treatments. Average daily feed intake was significantly greater for the milo diet than the hard or soft wheat diets with soybean meal providing the lysine source. Feed intake was greatest for the milo diet, but not significantly increased for either wheat diet with the synthetic lysine added. Feed required per pound of gain favored the wheat diets, which were 9% more efficient. This trial reaffirms previous work at Kansas State that showed the amino acid content of hard wheat will meet all the finishing pigs requirement for essential amino acids except lysine. In this trial, the addition of 8.75% soybean meal to the wheat diet to supply .25% lysine was not significantly beneficial, indicating again that the only limiting amino acid in wheat for the finishing pigs (125 to market weight) is lysine. Pigs consuming the soft wheat diets performed similarly to those receiving hard wheat diets.

Table 1. Effect of Hard Versus Soft Wheat on Performance of Finishing Swine<sup>ab</sup>

Grain	Milo	Hard Wheat	Soft Wheat
Avg. daily gain, lbs	1.84	1.79	1.86
Avg. daily feed intake, lbs	6.84	6.53	6.85
Feed/gain	3.72	3.67	3.69

<sup>a</sup>Each mean is an average of 6 pens (3 pigs per pen)

<sup>b</sup>Average initial weight, 135 lbs; average final weight, 266 lbs.

Table 2. Effect of Method of Processing Soft and Hard Wheat Diets in Swine Performance<sup>a</sup>

Process method: Wheat type:	3/16" grind		1/4" grind		Rolled		Pellet	
	Soft	Hard	Soft	Hard	Soft	Hard	Soft	Hard
Avg. daily gain, lbs	1.60	1.62	1.70	1.58	1.63	1.68	1.73	1.75
Avg. daily feed intake, lbs	6.57	6.52	6.92	6.54	6.44	6.47	6.20	6.37
Feed/gain	4.12	4.03	4.09	4.14	3.96	3.86	3.59	3.66

<sup>a</sup>Average initial weight, 148 lbs; average final weight 229 lbs.

Two replicates, 9 pigs per pen.

Table 3. Effect of Process Method of Wheat Diets on Performance<sup>a</sup>

Process Method:	Ground		Rolled	Pellet
	3/16"	1/4"		
Avg. daily gain, lbs <sup>b</sup>	1.61	1.64	1.66	1.74
Avg. daily feed int., lbs <sup>bc</sup>	6.56	6.73	6.46	6.30
Feed/gain <sup>de</sup>	4.08	4.12	3.91	3.62

<sup>a</sup>4 pens/treatment (9 pigs/pen); average initial wt., 148 lbs.

<sup>b</sup>Pellet vs ground & rolled (P<.06).

<sup>c</sup>Process effect (P<.10).

<sup>d</sup>Ground vs rolled (P<.06).

<sup>e</sup>Pellet vs ground & rolled.

Table 4. Soft versus Hard Wheat for Finishing Swine<sup>a</sup>

Type of wheat	Hard	Soft
Avg. daily gain, lbs	1.66	1.66
Avg. daily feed int., lbs	6.47	6.54
Feed/gain	3.92	3.94

<sup>a</sup>8 pens/treatment (9 pigs/pen); average initial weight, 148 lbs; average final weight, 229 lbs (48 day trial).

Table 5. Composition of Diets Used in Trial 3

Ingredients, lbs	Diet		
	Milo	Wheat-SBM	Wheat-Lysine
Soft or hard wheat	--	1763	1921.5
Milo	1659	---	---
Soybean meal (44%)	265	175	---
L-Lysine*HCL (78% lysine)	---	---	6.5
Dicalcium phosphate	30	23	23.0
Limestone	20	23	23.0
Salt	10	10	10.0
Trace mineral (Z-10)	2	2	2.0
Vitamin and antibiotic	14	14	14.0

Table 6. Effect of Wheat Type and Lysine Source on Performance of Finishing Swine<sup>a</sup>

Grain: Lysine source:	Milo	Hard wheat		Soft wheat	
	SBM	SBM	L-lysine	SBM	L-lysine
No. pigs	16	16	16	16	16
Int. wt., lbs	146.8	152.7	149.2	147.5	146.4
Final wt., lbs	207.7	221.2	213.0	215.6	209.3
Avg. da. gain, lbs	1.84 <sub>b</sub>	1.85	1.90 <sub>bc</sub>	1.76	1.81 <sub>bc</sub>
Avg. da. feed int., lbs	6.79 <sub>b</sub>	5.94 <sub>c</sub>	6.41 <sub>bc</sub>	5.99 <sub>c</sub>	6.54 <sub>bc</sub>
Feed/gain	3.70 <sub>b</sub>	3.21 <sub>c</sub>	3.37 <sub>c</sub>	3.39 <sub>c</sub>	3.52 <sub>c</sub>

<sup>a</sup>Two pens/treatment (8 pigs/pen)

<sup>bc</sup>Means on the same line with different superscripts differ significantly.