PROCESSING OF WHEAT FOR GROWING-FINISHING SWINE

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Story in Brief

A trial involving 470 crossbred pigs was conducted to evaluate fineness of grind and dry rolling of hard red winter wheat for growing-finishing swine and to compare wheat diets to a corn control diet. Results suggest that growing-finishing swine fed wheat tend to gain slower and have a lower average daily feed intake, but are more efficient than pigs fed a corn diet. The results also suggest that pigs fed a fine grind wheat diet gain faster and more efficiently than pigs fed a medium grind wheat diet. Pigs in this study fed a close dry rolled diet had an improved feed efficiency as compared to those fed a fine or medium ground wheat diet. This research suggests that a fine grind or close dry rolled wheat diet is preferred over a medium grind for growing and finishing swine.

(Key Words: Pig, Wheat, Processing.)

Introduction

Hard red winter wheat has been successfully used as a feedstuff for swine for many years. However, performance of pigs fed wheat diets is sometimes less than pigs fed corn or sorghum grain. (Luce et al., 1972; Maxwell et al., 1983).

Improved processing has been suggested as a way to improve the utilization of wheat by swine. Luce and Omtvedt (1970) reported no significant differences in average daily gain or feed efficiency among growing-finishing swine fed diets of fine, medium or coarse ground hard red winter wheat, but performance was less than expected for all treatments. Hale and Thompson (1986) reported that pigs fed a coarse ground soft winter wheat tended to have improved average daily gain and feed efficiency over pigs fed fine or medium grind diets. Since the effect of particle size of grind of wheat diets on the performance of growing-finishing swine remains unclear, a study was conducted to investigate it further.

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Materials and Methods

This study was conducted at the Southwestern Livestock and Forage Research Station, El Reno, OK and involved a total of 470 crossbred pigs. The trials were conducted in confinement on solid concrete floors.

All diets (Table 1) were formulated to contain .75 lysine during the growing phase (40 to 125 lb) and .62 lysine during the finishing phase (125 to 225 lb). The four treatments were 1) a corn control diet -- medium grind through a 5/16 in screen hammer mill, 2) a wheat diet -- fine grind through a 1/8 in screen hammer mill, 3) a wheat diet -- medium grind though a 3/16 in hammer mill, and 4) a close dry rolled wheat diet. The wheat used was a hard red winter wheat of the KARL variety.

A particle size analysis was conducted by the Animal Science Department of Kansas State University. The particle size based on an average of four separate samples of each diet was 840, 665, 936 and 1649 microns for Treatments 1 through 4, respectively.

Orthogonal contrasts (corn vs the average of all wheat treatments; fine vs. medium grind wheat; the average for ground wheat treatments vs dry rolled wheat) were used to compare treatment means.

Results and Discussion

During the growing period (Table 2) pigs fed the corn diet (Treatment 1) had a higher average daily feed intake ($P<.06$) than pigs fed the wheat diets (average of Treatments 2, 3 and 4). Pigs fed the fine grind wheat diet (Treatment 2) had an improved feed efficiency ($P<.07$) as compared to those fed the medium grind wheat diet (Treatment 3). Pigs fed the dry rolled wheat diet (Treatment 4) had an improved feed efficiency ($P<.05$) as compared with those fed the ground wheat diets (average of Treatments 2 and 3). Average daily gain did not differ between groups ($P>.10$), but tended to be higher for the pigs fed the corn control diet.

The results of the finishing period are presented in Table 3. Pigs fed the corn control diet (Treatment 1) had higher average daily gain ($P<.05$), higher average daily feed intake ($P<.01$) and a poorer feed efficiency ($P.<.01$) than those fed the wheat diets (average of Treatments 2, 3 and 4). Pigs fed the fine grind wheat diet (Treatment 2) had a higher average daily gain ($P<.01$) than those fed the medium grind wheat diet (Treatment 3).

The results for the overall postweaning period (growing and finishing) are presented in Table 4. Pigs fed the corn diet (Treatment 1) had a higher average daily gain ($P<.01$), a higher daily feed intake ($P<.02$) and were more efficient ($P<.04$) than those fed the wheat diets (average of Treatments 2, 3, and 4). Pigs fed the fine grind wheat diet (Treatment 2) had a higher average daily

gain (P<.01) and were more efficient (P<.06) than those fed the medium grind wheat diet (Treatment 3). Pigs fed the ground wheat diets (average of treatments 2 and 3) had a poorer feed efficiency (P<.03) and more back fat thickness (P<.06) than those fed the dry rolled wheat diet (Treatment 4).

Results from this study suggest that growing-finishing pigs fed hard red winter wheat diets (KARL variety) tend to gain slower and have a lower average daily feed intake, but are more efficient than pigs fed a yellow corn diet. The increased feed intake of the pigs fed the corn diet was the apparent cause of the poorer feed efficiency relative to those fed the wheat diets.

Results also suggest that pigs fed a fine grind wheat diet gain faster and more efficiently than pigs fed a medium grind wheat diet. These results were not in agreement with a study by Luce and Omtvedt (1970) who reported no difference in performance of pigs fed fine, medium or coarse wheat diets or a study by Hale and Thompson (1986) who reported that pigs fed a coarse ground wheat had improved performance compared to those fed medium or fine grind wheat diets. However a different variety of hard winter wheat was used by Luce and Omtvedt (1970) and Hale and Thompson (1986) used a soft winter wheat in their study.

Pigs in the present study fed a close dry rolled wheat had an improved feed efficiency as compared with those fed either ground wheat diet. This is difficult to understand since the average particle size was considerably larger than the particle size of either the fine or medium grind diets. Luce and Omtvedt (1970) reported no difference in feed efficiency of pigs fed ground or close dry rolled hard winter wheat diets.

The lower backfat thickness for pigs fed the dry rolled wheat diets can probably be explained by the decreased feed intake of these pigs compared with those fed the other diets.

This research suggests that a fine grind or close dry roll wheat diet is preferred over a medium grind for growing-finishing swine. Pigs fed wheat diets tend to gain slower but more efficiently than those fed a corn diet.

Literature Cited

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Table 1. Composition of experimental diets.

	Growing diets		Finishing diets	
Ingredients	Corn control	Wheat	Corn control	Wheat
Yellow corn	77.15	-	82.35	-
Wheat[a]	-	81.50	-	86.95
Soybean meal, 44%	19.50	15.25	14.50	10.00
Calcium carbonate	.85	.85	.75	.85
Dicalcium phosphate	1.25	1.15	1.40	1.20
Salt	.50	.50	.50	.50
Vitamin-trace mineral mix[b]	.25	.25	.25	.25
Tylan 10[c]	.50	.50	-	-
CTC 10[d]	-	-	.25	.25
Total	100.00	100.00	100.00	100.00
Calculated composition				
Metabolized energy, kcal/lb	1480	1424	1488	1428
Crude protein, %	15.14	17.13	13.38	15.52
Lysine, %	.75	.75	.62	.62
Calcium, %	.76	.75	.70	.70
Phosphorus, %	.65	.65	.60	.60

[a] Hard red winter wheat, KARL variety.

[b] Supplied 5,000,000 IU vitamin A, 500,000 IU vitamin D, 5 gm riboflavin, 22.50 gm pantothenic acid, 35 gm niacin, 125 gm choline chloride, 25 mg vitamin B12, 30,000 IU vitamin E, 3.3 gm menodine, 270 mg iodine, 90 gm iron, 18 gm manganese, 9 gm copper, 90 gm zinc and 270 mg selenium per ton of feed.

[c] 10 grams of tylosin per lb of premix.

[d] 10 grams of chlorotetracycline per lb of premix.

Table 2. Effects of processing wheat on performance of growing swine (40-125 lb).

	Treatments			
	1[a] corn med. grind (5/16 in)	2[a] wheat fine grind (1/8 in)	3[a] wheat med.grind (3/16 in)	4[a] wheat dry roll close
No. of pigs	139	105	116	110
Average daily gain,lb	1.68	1.62	1.58	1.62
Average daily feed intake,lb[b]	4.50	4.24	4.34	4.17
Feed, lb gain, lb[cd]	2.72	2.63	2.74	2.58

[a] Average particle size for Treatments 1 through 4 were 845, 665, 936 and 1649 microns, respectively.

[b] Treatment 1 differs from average of Treatments 2, 3 and 4 (P<.06).

[c] Treatments 2 and 3 differ (P<.07).

[d] Average of Treatments 2 and 3 differ from Treatment 4 (P<.05).

Table 3. Effects of processing wheat on performance of finishing swine (125-225 lb).

	Treatments			
	1[a] corn med. grind (5/16 in)	2[a] wheat fine grind (1/8 in)	3[a] wheat med.grind (3/16 in)	4[a] wheat dry roll close
No of pigs	128	94	113	103
Average daily gain, lb[bc]	2.00	2.00	1.88	1.96
Average daily feed intake, lb[d]	7.14	6.69	6.54	6.38
Feed, lb gain, lb[d]	3.65	3.42	3.59	3.34

[a] Average particle size for Treatments 1 through 4 were 845, 665, 936 and 1649 microns, respectively.

[b] Treatment 1 differs from average of Treatments 2, 3 and 4 ($P<.05$).

[c] Treatments 2 and 3 differ ($P<.01$).

[d] Treatment 1 differs from average of Treatments 2, 3 and 4 ($P<.01$).

Table 4. Effects of processing wheat on performance of growing-finishing swine (40-225 lb).

	Treatments			
	1[a] corn med grind (5/16 in)	2[a] wheat fine grind (1/8 in)	3[a] wheat med.grind (3/16 in)	4[a] wheat dry roll close
No. of pigs	128	94	113	103
Average daily gain, lb[bc]	1.83	1.82	1.72	1.79
Average daily feed intake, lb[d]	5.71	5.40	5.42	5.20
Feed, lb gain, lb[efg]	3.18	3.04	3.18	2.97
Avg backfat thickness, in[h]	1.30	1.27	1.31	1.24

[a] Average particle size for Treatments 1 through 4 were 845, 665, 936 and 1649 microns respectively.

[b] Treatment 1 differs from average of Treatments 2, 3 and 4 ($P<.01$).

[c] Treatment 2 and 3 differ ($P<.01$).

[d] Treatment 1 differs from average of Treatments 2, 3 and 4 ($P<.02$).

[e] Treatment 1 differs from average of Treatments 2, 3 and 4 ($P<.04$).

[f] Treatments 2 and 3 differ ($P<.06$).

[g] Average of Treatments 2 and 3 differs from Treatment 4 ($P<.03$).

[h] Average of Treatments 2 and 3 differs from Treatment 4 ($P<.06$).

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