THE INTERRELATIONSHIP BETWEEN GENOTYPE, SEX, AND DIETARY LYSINE EFFECTS ON CARCASS CHARACTERISTICS IN 230 AND 280 LB FINISHING PIGS[1]

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Summary

One hundred and twenty pigs (initially 96 lb BW) were slaughtered either at 230 lb (40 pigs) or at 280 lb (80 pigs) to determine the interrelationship between genotype, sex, and dietary lysine effect on carcass characteristics in a 2 × 2 × 2 factorial arrangement. Genetic comparisons were made between pigs characterized by either high or medium potential for lean tissue gain. Barrows and gilts were separately fed either .90 or .70% dietary lysine within genotype. One pig per pen was slaughtered for carcass evaluation at a pen mean weight of 230 lb, with the remaining two pigs fed .75 or .55% dietary lysine until a pen mean weight of 280 lb was obtained. At this point, the remaining two pigs were slaughtered for carcass evaluation. High lean-gain pigs slaughtered at 230 lb had a heavier chilled carcass weight and longer carcasses than medium lean-gain pigs. Gilts had larger loineye area and less backfat compared to barrows. Increased dietary lysine did not influence carcass characteristics at 230 lb. At 280 lb, high lean-gain pigs had increased hot carcass weight, chilled carcass weight, loineye area and carcass length compared to medium lean-gain pigs. Gilts had an increased dressing percentage, loineye area, and carcass length in conjunction with decreased backfat thickness and kidney fat compared to barrows. Increased dietary lysine did not influence carcass characteristics in pigs slaughtered at 280 lb. These data indicate that carcass characteristics were not influenced by genotype at 230 lb. However, in the group fed to 280 lb, high lean-gain pigs had superior carcasses compared to medium lean gain pigs. Carcass characteristics were optimized in gilts at either slaughter weight, suggesting that high lean-gain gilts can be fed to heavier weights without sacrificing carcass merit.

(Key Words: Pigs, Genotype, Sex, Lysine, Backfat, Loineye Area.)

Introduction

As the swine industry moves closer to a value-based market, the demand for high lean carcasses is continually increasing. Current merit value buying programs offer a premium between 103.3 and 111.0% as a percentage of the base sale price for 230 to 245 lb pigs, when backfat is reduced below .6 in. This system offers the producer an opportunity to increase profit margins for the sale of superior carcasses. It also gives the producer an incentive to improve the finishing pigs marketed by using improved genotypes, implementing split-sex feeding, and altering nutritional programs to maximize the rate of lean gain and the efficiency at which lean tissue is deposited. Thus, the objective of this experiment was to determine the interrelationship between genotype, sex, and dietary lysine effects on carcass characteristics in finishing pigs fed to 230 and 280 lb.

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Procedures

The experimental design and animal handling procedures are described in the preceding paper. Briefly, 120 pigs (initially 96 lb BW) were used in a 2 × 2 × 2 factorial arrangement. Pigs were predetermined as high or medium lean-gain potential, and barrows and gilts were fed separately within genotype. Either .90 or .70% dietary lysine was fed until the pen average weight of 230 lb was achieved. At this point, one pig/pen (five pigs/treatment) was slaughtered for carcass evaluation, and the remaining two pigs were fed .75% or .55% dietary lysine, respectively. Both remaining pigs were slaughtered at a pen mean weight of 280 lb for carcass evaluation.

Carcass Data Collection. Carcasses were weighed at slaughter and reweighed 24 hr postmortem to record hot and chilled carcass weights and determine dressing percentage. At slaughter, the heart, liver, kidneys, and kidney fat were removed and weighed. Backfat thickness was measured at the first rib, last rib, and last lumbar vertebrae. Measurements were taken from both the right and left sides, with the average backfat thickness calculated from the six measurements. Tenth rib fat thickness was measured 3/4 the length of the loin muscle from the midline. Loin muscle area at the 10th rib and carcass length were also recorded on the chilled carcasses.

Results and Discussion

Treatment effects were not detected for live or hot carcass weight when pigs were slaughtered at a mean weight of 230 lb (Table 4). Medium lean-gain pigs had lighter ($P<.05$) chilled carcass weight 24 h postmortem compared to high lean-gain pigs (165.2 vs 171.0 lb, respectively). High lean gain pigs also had longer carcasses ($P<.01$) than did medium lean-gain pigs (31.89 vs 30.68 in, respectively). Average backfat thickness and tenth rib fat depth were less ($P<.01$) in gilts compared to barrows (1.04 vs 1.18 and .96 vs 1.24 in, respectively). Conversely, loineye area was larger ($P<.01$) in gilts than in barrows (5.30 vs 4.61 in^2, respectively). Kidney fat weight and dressing percent were not affected by treatment.

At 280 lb, live weight was similar among all eight experimental treatments (Table 2). However, hot and chilled carcass weights were heavier ($P<.01$) in high lean-gain pigs compared to medium lean-gain pigs (216.90 vs 211.82 lb and 212.98 vs 208.32 lb, respectively). Dressing percentage was lower ($P<.05$) in barrows compared to gilts. Gilts had less ($P<.01$) average backfat thickness (1.29 vs 1.42 in, respectively) and tenth rib fat depth (1.20 vs 1.47 in, respectively) compared to barrows. Loineye area was larger ($P<.01$) in high lean-gain pigs compared to medium lean-gain pigs (6.06 vs 5.50 in^2, respectively). Within genotype, gilts had larger ($P<.01$) loineye area compared to barrows (6.14 vs 5.48 in^2, respectively). High lean-gain pigs had increased ($P<.01$) carcass length compared to medium lean gain pigs (33.45 vs 32.81 in, respectively). Gilts had ($P<.05$) longer carcasses compared to barrows regardless of genotype (33.39 vs 32.92 in, respectively). Barrows had more carcass kidney fat than gilts (6.01 vs 5.21 lb, respectively).

These data indicate that genotype did not have a large influence on carcass characteristics for 230 lb pigs. However, acceptable carcasses were obtained from both the medium and high lean-gain genotypes. This can potentially be explained by the high ADFI and lysine intake/d for both genotypes reported in the previous paper. Although carcass characteristics were not influenced by genotype, the rate of lean tissue gain and the efficiency of lean tissue gain was improved dramatically (previous paper). This suggests that high lean-gain pigs can produce acceptable carcasses similar to medium lean-gain pigs at a faster rate and more efficiently, decreasing the days to market and the amount of feed required to reach a desired market weight. Within genotype, gilts had superior

carcasses compared to barrows. Gilts typically have a higher lean proportion compared to barrows because of increased feed efficiency. Decreased ADFI in gilts results in an increased proportioning of feed intake towards muscle accretion as opposed to fat deposition. The increase in muscle accretion, in turn, increases body maintenance requirements, which also decreases energy concentrations for fat deposition. Increased dietary lysine did not influence carcass characteristics, which can be explained by the high lysine intake/d for both dietary lysine regimes.

In the group fed to 280 lb, high lean-gain pigs had increased loin eye area and decreased backfat thickness compared to medium lean gain pigs. These data imply that pigs selected for increased lean gain have an extended growth curve, allowing these pigs to be fed to heavier weights without drastically increasing backfat thickness compared to medium lean gain pigs. Gilts retained superiority compared to barrows, with carcasses from gilts having increased loin eye area and decreased backfat thickness compared to barrows. This improvement in carcass merit may be related to increased amino acid requirements because of decreased ADFI, resulting in a more efficient use of amino acids consumed. Increased dietary lysine did not influence carcass merit, because lysine intake was adequate regardless of dietary lysine regime.

Melanie Krause analyzing samples in the swine research lab.

Table 1. The Effect of Genotype, Sex, and Dietary Lysine on Carcass Characteristics in Pigs Fed to 230 lb[a]

	High lean genotype				Medium lean genotype				
	Barrows		Gilts		Barrows		Gilts		
Item	.90[b]	.70	.90	.70	.90	.70	.90	.70	CV
Live wt, lb	240.59	240.79	235.20	238.19	240.20	230.60	235.40	234.50	3.56
Hot carcass wt, lb	173.01	175.01	174.31	173.10	172.90	162.49	171.09	168.50	4.11
Chilled carcass wt, lb[c]	169.91	171.71	170.70	171.71	169.40	159.90	167.60	163.75	3.86
Dressing percentage, %	71.91	72.68	74.11	72.67	71.98	70.46	72.68	71.85	3.82
Backfat thickness, in[e]	1.18	1.09	.96	1.08	1.27	1.21	1.11	1.02	13.25
Tenth rib fat depth, in[e]	1.27	1.14	.86	1.11	1.34	1.21	.96	.89	19.37
Loin area, in^{2}[e]	4.64	4.87	5.50	5.29	4.63	4.31	5.19	5.18	11.19
Carcass length, in[c]	32.18	31.50	32.16	31.74	30.38	30.46	30.86	31.13	2.00
Kidney fat, lb	3.67	3.56	2.62	3.83	3.63	4.14	3.96	3.76	36.37

[a]Means calculated from 40 pigs at a pen mean weight of 230 lb, 1 pig/pen, 5 pigs/treatment.
[b]Dietary lysine content.
[c,d]Genotype effect ($P<.01$) and ($P<.05$) respectively.
[e,f]Sex effect ($P<.01$) and ($P<.05$) respectively.
[g,h]Dietary lysine effect ($P<.01$) and ($P<.05$), respectively.

Table 2. The Effect of Genotype, Sex, and Dietary Lysine on Carcass Characteristics in Pigs Fed to 280 lb[a]

	High lean genotype				Medium lean genotype				
	Barrows		Gilts		Barrows		Gilts		
Item	.75[b]	.55	.75	.55	.75	.55	.75	.55	CV
Live wt, lb	292.10	291.60	289.30	284.90	287.40	288.20	284.25	283.00	2.51
Hot carcass wt, lb[c]	217.40	215.05	218.81	216.30	214.30	211.00	211.46	210.52	2.44
Chilled carcass wt, lb[c]	213.71	211.31	214.63	212.30	210.69	207.50	207.55	207.17	2.47
Dressing percentage, %[f]	74.48	73.73	75.65	75.94	74.59	73.18	74.82	74.26	2.03
Backfat thickness, in[e]	1.45	1.34	1.22	1.28	1.53	1.35	1.35	1.32	9.75
Tenth rib fat depth, in[e]	1.57	1.35	1.13	1.26	1.57	1.39	1.24	1.21	16.17
Loineye area, in^{2} [ce]	5.52	5.91	6.57	6.25	5.23	5.27	5.93	5.69	8.11
Carcass length, in[cf]	32.89	33.28	33.87	33.77	32.71	32.81	33.06	32.66	1.50
Kidney fat, lb[f]	5.10	6.18	5.61	5.61	5.81	5.85	5.19	4.49	15.85

[a]Means calculated from 80 pigs at a pen mean weight of 280 lb, 2 pig/pen, 5 pigs/treatment.
[b]Dietary lysine content.
[c,d]Genotype effect ($P<.01$) and ($P<.05$) respectively.
[c,f]Sex effect ($P<.01$) and ($P<.05$) respectively.
[g,h]Dietary lysine effect ($P<.01$) and ($P<.05$), respectively.