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The Influence of Frame Size on Growth and Carcass Characteristics of Swine Taken to Heavy Weights

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Despite over two decades of selection for leaner hogs, excess fat remains a major problem in market swine today. Fat is an expensive product to produce and research clearly indicates that feed/gain increases when an animal's bone and muscle growth decreases and deposition of fat increases.

In recent years progressive swine producers have sought a larger framed hog that matures at a heavier weight. In theory, these large framed pigs are leaner and maintain desirable feed/gain to heavier weights and therefore offer the flexibility to be marketed at heavier weights if favorable marketing conditions prevail.

The study reported herein was designed to evaluate large and small framed pigs for growth and carcass characteristics when taken to a 300-pound slaughter weight.

Experimental Procedure

Five trials involving 120 head of crossbred hogs were conducted in this experiment. A total of 80 head, 49 barrows and 31 gilts, were slaughtered and complete carcass data obtained. An additional 32 gilts were fed for gain and feed efficiency data before entering the breeding herd. Eight head were removed from the test for a variety of reasons.

A majority of the pigs used in this study were from the South Dakota State University swine herd which consists of three-way crossbred hogs involving Durocs, Hampshires and Yorkshires. Pigs from an outside source which were Chester White sired were used in one phase of the study to sample a population outside of the South Dakota State University herd.

At the beginning of each trial, pigs of the desired weight were sorted for frame size by visual appraisal. Small framed pigs can be described as those pigs which were lower set, shorter legged, shorter bodied and wide through the thoracic region in relation to their depth of body. These pigs were selected to fit an early maturing model. Large framed pigs, on the other hand, were taller, longer legged and bodied and deep in relation to their width of body in the thoracic region.

Pigs selected were at the extremes of the normal distribution of frame size, representing approximately the upper and lower 15% of the South Dakota State University swine herd. However, they did not represent extremes in the swine population today as the small framed pigs had near industry average backfat measurements at slaughter (industry average figures based on a much lighter slaughter weight).

Trials differed in starting weight. The first three trials concentrated on selecting pigs of market weight and trials 4 and 5 were initiated with lighter weight pigs. An intermediate frame group was also selected in trial 5. All pigs were fed within sex and treatment groups and received a standard finishing diet. All trials were conducted in a fully slatted, controlled environment barn.

Results

Feed/gain and average daily feed data for all trials combined are presented in table 1. Feed/gain follows a trend with the large framed pigs the most efficient in feed conversion. Analysis of variance for feed/gain indicated that these treatment differences approached significance (P=.15). Average daily feed did not follow a trend, although the large framed pigs had the largest appetites.

TABLE 1. FEED/GAIN AND AVERAGE DAILY FEED
(220 LB TO END OF ALL TRIALS)

	Treatment			Sex	
	Large framed	Intermediate framed	Small framed	Barrows	Gilts
Feed/gain	4.51	4.70	5.13	4.98	4.58
Avg daily feed, lb	6.47	5.96	6.24	6.16	6.28

Trial 1 results are presented in table 2. Small framed pigs outgained the large framed pigs, although not significantly. Barrows gained significantly faster than gilts. Gilts were not slaughtered in this trial and carcass data show a significant advantage to large framed barrows in carcass meatiness traits. Carcasses of large framed pigs had 23% larger loin eye areas, 36% less tenth rib backfat, were 4.5% longer, had 14% more lean and 15% more lean in ham and loin than carcasses of small framed pigs.

TABLE 2. PERFORMANCE AND CARCASS CHARACTERISTICS, TRIAL 1
(GILTS AND BARROWS)

	Large framed	Small framed	Barrows	Gilts
Initial weight, lb	217.69	218.06	220.50	215.25
Final weight, lb	282.56	286.63	293.25*	275.94
Avg daily gain, entire test, lb	1.54	1.63	1.73*	1.45
Carcass weight, lb	216.13	223.8		
Loin eye area, sq. in.	5.34**	4.35		
Tenth rib backfat, in.	1.22**	1.92		
Carcass length, in.	34.29**	32.81		
Percent lean (formula determined)	52.41**	46.02		
Percent lean in ham and loin (actual)	56.65**	49.13		

* P<.05.

** P<.01.

The results of an all-gilt trial, the second in this experiment, are presented in table 3. Large framed gilts gained significantly faster than the small framed treatment group. In addition, they were leaner, longer and possessed a higher percent lean in the ham and loin from actual cutout.

TABLE 3. PERFORMANCE AND CARCASS CHARACTERISTICS, TRIAL 2 (GILTS)

	Large framed	Small framed
Initial weight, lb	232.12	232.75
Final weight, lb	300.62	292.40
Avg daily gain, entire test, lb	1.58**	.95
Carcass weight, lb	229.25	227.00
Loin eye area, sq. in.	6.04	6.05
Tenth rib backfat, in.	1.18*	1.49
Carcass length, in.	33.84**	32.08
Percent lean (formula)	53.68	51.82
Percent lean in ham and loin	59.00*	55.46

* P<.05.

** P<.01.

Trial 3 results appear in table 4. As in trial 2, the large framed pigs outgained their small framed counterparts and, surprisingly, gilts outgained barrows. Evidence of their lateness of maturity was shown for large framed barrows which were superior in carcass leanness traits, although not significantly in all cases.

TABLE 4. PERFORMANCE AND CARCASS CHARACTERISTICS, TRIAL 3 (BARROWS AND GILTS)

	Large framed	Small framed	Barrows	Gilts
Initial weight, lb	239.81	239.56	245.06*	234.31
Final weight, lb	299.94	288.69	295.38	293.25
Avg daily gain, entire test, lb	1.56*	1.28	1.30	1.54
Carcass weight, lb	227.12	224.62		
Loin eye area, sq. in.	5.30	5.33		
Tenth rib backfat, in.	1.21*	1.42		
Carcass length, in.	34.08**	33.69		
Percent lean (formula)	51.68	50.88		
Percent lean in ham and loin	54.43	53.59		

* P<.05.

** P<.01.

Gilts and barrows were slaughtered in trial 4 and performance and carcass data are shown in table 5. Consistent with other trials, large framed pigs gained faster and were leaner than small framed pigs. Barrows had a slight advantage over gilts in gain and, surprisingly, had less tenth rib backfat. Gilts had a significant advantage in loin eye area.

TABLE 5. PERFORMANCE AND CARCASS CHARACTERISTICS, TRIAL 4
(BARROWS AND GILTS)

	Large framed	Small framed	Barrows	Gilts
Initial weight, lb	161.62	159.25	161.88	159.00
Final weight, lb	287.50	284.88	292.00	280.38 ^a
Avg daily gain, 160 to 220 lb, lb	1.90*	1.43	1.68	1.64
Avg daily gain, 220 lb to end, lb	1.28	1.05	1.22	1.12
Carcass weight, lb	223.04	221.71	221.25	223.50
Loin eye area, sq. in.	5.73	5.61	5.17	6.17**
Tenth rib backfat, in.	1.02	1.20	1.07	1.14
Carcass length, in.	34.35	33.66	34.25	33.76
Percent lean (formula)	53.82	52.57	52.26	54.13
Percent lean in ham and loin	57.58	56.51	57.95	56.14

^a Contains data on two gilts not slaughtered.

* P<.05.

** P<.01.

An intermediate framed group was added to trial 5 which was initiated with lighter weight pigs. Accuracy of visual selection for frame size was evident in that leanness and length traits followed expected trends (table 6). There was no difference in average daily gains among treatment groups in this trial, although gilts had a slight advantage in this trait. Gilts were also longer, leaner and had larger loin eyes than barrows.

Summary

One hundred twenty crossbred pigs were used to evaluate growth and carcass characteristics of pigs of varying frame sizes. Growth rate beyond 220 pounds was of primary interest and favored the large framed pigs in three of five trials. However, gains of pigs decreased at heavier weights and, in general, could be considered as unsatisfactory regardless of frame size. Feed/gain data from all trials combined showed large framed pigs to be the most efficient.

Carcasses of large framed pigs were consistently longer, had less backfat and a higher percent lean than carcasses of small framed pigs.

TABLE 6. PERFORMANCE AND CARCASS CHARACTERISTICS, TRIAL 5
(BARROWS AND GILTS)

	Large framed	Inter- mediate framed	Small framed	Barrows	Gilts
Initial weight, lb	113.92	116.42	115.63	115.22	115.42
Final weight, lb	295.46	298.58	297.46	295.33	299.00
Avg daily gain, 115 to 160 lb, lb	1.82	1.58	1.81	1.69	1.78
Avg daily gain, 160 to 220 lb, lb	1.59	1.71	1.51	1.60	1.60
Avg daily gain, 220 lb to end, lb	1.22	1.28	1.24	1.14	1.35
Carcass weight, lb	225.25	229.71	225.00 ^a	230.22	223.08 ^a
Loin eye area, sq. in.	5.64	5.88	5.36	5.53	5.72
Tenth rib backfat, in.	1.18	1.37	1.61	1.50	1.26
Carcass length, in.	34.13	33.62	33.26	33.23	34.11*
Percent lean (formula)	52.71	52.30	49.90	50.87	52.41
Percent lean, ham and loin	58.23	58.12	54.62	55.20	58.79

^a Carcass weight data includes one animal which was skinned.

* P<.05.