Performance of Swine Sired by High vs Low Indexing Hampshire Boars

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Story in Brief

Hampshire boars were purchased from test stations in pairs, with each pair including one high indexing boar and one low indexing boar. The index used included average daily gain, backfat and feed efficiency. Offspring of these boars were evaluated for postweaning performance and carcass traits to compare use of high vs low indexing boars. Barrow and gilt offspring of high indexing boars were faster growing ($P<.1$), had less backfat ($P<.1$) and were more efficient ($P<.1$). A sample of barrow offspring showed little advantage for either high or low indexing sires for carcass traits. These results indicate that high performing boars from test stations will sire pigs that perform better during the postweaning phase and will, therefore, improve the efficiency of production during that period.

Introduction

Selection is the practice of allowing only those animals that are superior to reproduce. It is the way that populations of animals are improved genetically. There are two primary ways that selection in swine is practiced. The first, and potentially the most important, is the on-farm testing program. The second is the boar test station. The function of a boar test station is to evaluate average daily gain, feed efficiency and backfat of boars from various sources in a common testing environment. Numerous research studies have shown that selection for these traits could be effective. These studies were conducted under rather rigid experimental conditions and did not include some aspects, such as varying pre-test nutrition, which the buyer of a test station boar would encounter. This study was initiated to compare the offspring of boars that performed well in a test station with offspring of boars that performed poorly.

Materials and Methods

The test station index recommended by the National Swine Improvement Federation is $I = 100 + 60\ (G-\bar{G}) - 75\ (F-\bar{F}) - 70\ (B-\bar{B})$ where G is average daily gain, F is feed efficiency, B is backfat thickness and $\bar{G}$, $\bar{F}$ and $\bar{B}$ are the test group means for these three traits. The index is constructed in such a way that the average boar has an index of 100, and approximately 68 percent of the boars have an index between 75 and 125. Most test stations keep any boar with an index below 80 out of the sale.

Twelve Hampshire boars were purchased for each of two seasons from test stations which test boars in pens of three boars with the same sire. Boars were purchased in pairs, with each pair including one boar with an index over 120 and one boar with an index below 90. More than one pair of boars was purchased at a given sale on several occasions. Performance summaries of the purchased boars are shown in Table 1. There were 48 and 41 index units separating the high indexing and the low indexing boars for the two seasons, respectively. These differences were largely due to differences in average daily gain and feed efficiency.

The 12 boars were randomly mated to 100 crossbred gilts in each season of mating. Pigs were farrowed in a central farrowing barn, weaned at 42 days of age and put on test when they were approximately 63 days old. Test pens contained between 12 and 18 pigs (single sire groups as much as possible). They were fed a growing ration with 16 percent crude protein until the pen averaged 120 lb and then a 14 percent crude protein finishing ration until the end of the test. Pigs were weighed weekly and were removed from test when they exceeded 220 lb. An estimate of backfat thickness was obtained with an ultrasonic backfat probe when each pig was removed from the test. Average daily gain was calculated for each pig from the beginning of the test to the time when that pig reached 220 lb, and feed efficiency (lb feed/lb gain) was calculated for each pen.

One barrow was chosen at random from each litter for obtaining carcass data. These barrows were slaughtered at the OSU Meat Laboratory and length (first rib to tip of the aitchbone); backfat thickness (average of first rib, last lumbar vertebrae); loin eye area at the tenth rib; the weights of the ham, loin, shoulder and belly; and percent lean cuts (percent of the live weight) were obtained.

There were 790 barrows and gilts measured for average daily gain, feed efficiency and backfat and 127 barrows slaughtered for carcass data. Data were analyzed so that high vs low sired pigs could be compared with the effects of sex, season and breeding of the dam accounted for.

Table 1. Performance of Hampshire boars purchased from test stations

Season	Average daily gain lb/day	Feed efficiency lb feed/lb gain	Backfat in.	Index units
		High Indexing Boars		
Fall 1979	2.27	2.34	.73	131
Spring 1980	2.19	2.55	.69	128
		Low Indexing Boars		
Fall 1979	1.80	2.62	.74	83
Spring 1980	1.87	2.84	.71	87

Table 2. Performance of barrows and gilts sired by Hampshire boars purchased from test stations

Line of Sire	Number of offspring	Average daily gain lb/day	Feed efficiency lb feed/lb gain	Backfat in.
High	409	1.400[a]	2.981[b]	.855[c]
Low	381	1.375	3.041	.901

[a,b,c] The high vs low comparison for these traits approaches statistical significance ($P<.10$).

Table 3. Carcass traits of barrows sired by Hampshire boars purchased from test stations

Line of Sire	Number of barrows	Length in.	Backfat in.	Loin eye area in^2	Ham wt lb	Loin wt lb	Shoulder wt lb	Belly wt lb	% lean cuts
High	59	31.09	1.034	4.270	33.25	28.66	28.06	17.42	39.27
Low	68	31.31	1.041	4.208	34.92	28.97	27.74	17.47	39.11

Results and Discussion

The performance of barrows and gilts sired by high and low indexing Hampshire boars is shown (Table 2). The pigs sired by the high indexing boars grew faster ($P<.1$), were more efficient ($P<.1$) and had less backfat ($P<.1$). The differences were not large but were similar to what was expected based on the heritabilities of the traits. The expected heritability of the index, based on heritabilities of .30, .35 and .50 for average daily gain, feed efficiency and backfat, respectively, was .36. The effective heritability based on the high vs low comparisons was .32. This difference between expected and effective heritability is unsurprising in view of the widely varying pre-test conditions the boars were exposed to.

Comparison of carcass traits of barrows sired by high vs low indexing Hampshire boars showed little advantage for either type of sire. Barrows sired by high indexing boars had less length and backfat; larger loin eye; less ham, loin and belly weight; and more shoulder weight as well as a higher proportion of lean cuts (percent of live weight) than those barrows sired by low indexing boars. None of these differences were statistically significant. These results suggest that fairly small changes in carcass composition would be expected when selection is for postweaning performance.

These results indicate that superior performing boars sire offspring that perform better during the postweaning period than boars with inferior performance. The differences were not large but were close to the expected differences, based on the heritabilities of the traits. Test stations should be a good source of boars for both commercial and seedstock producers interested in improving the performance of their pigs. They provide confidence that the boars were objectively appraised and were tested fairly. Use of high indexing boars from test stations should gradually improve the performance of a swine herd. Each small increment should be reasonably permanent, and they will accumulate with time.

A very important aspect of this study is that it provides an example of how testing will work when it is used on the farm by seedstock producers. Routine evaluation of growth rate and backfat of boars and gilts in seedstock herds will result in improved performance in the herds of their commercial customers if the information is used in making selection decisions.
