ernal environment prior to weaning that not only affects feedlot performances but also causes their pigs to be leaner and more heavily muscled than the same breed combination out of Duroc or Hampshire dams.

Summary. The heritabilities for feedlot performance and carcass traits are moderate to high, thus the comparisons among straightbreds suggests that on the average Duroc sires should produce pigs that gain faster and produce firmer and more marbled carcasses than pigs out of Hampshire or Yorkshire sires when all are bred to the same breed of dam. Similarily, Hampshire sires should on the average produce pigs that have carcasses that have a higher percent lean, less backfat and larger loin eyes than Yorkshire or Duroc sires.

The differences in reciprocal crosses indicate that if Yorkshires are to be used in the cross, they should be used as the dam breed. Crosses involving the Yorkshire are more efficient in the feedlot and produce carcasses that are leaner and more heavily muscled when the Yorkshire is used as the dam than as the sire.

The data indicate that significant heterosis can be expected for average daily gain, age at 220 lbs., feed efficiency, average daily feed consumption and carcass length and very little heterosis is to be expected for most carcass traits.

Trends in Performance of Boars in the Oklahoma Swine Test Station

R. K. Johnson and W. G. Luce

Story in Brief

The performance records of 385 boars of seven breeds that completed the tests conducted by the Oklahoma Swine Evaluation Station have been analyzed to determine the average changes in performance over time for the tests conducted from 1971 spring to 1974 spring. The traits measured were individual average daily gain and pen feed efficiency from 70 to 220 lbs., backfat thickness and loin eye area at 220 lbs. and a performance index composed of a combination of gain, feed efficiency and backfat.

Very few significant changes have occurred in the average performance for boars of each breed. In general, most changes in average performance for boars of each breed have been in the desired direction. Most breeds have shown a steady increase since the first test in growth rate and a corresponding reduction in the pounds of feed required per pound of gain. Backfat changes over time have been small and not consistently in the desired direction for all breeds. Loin eye area has shown a steady increase over time for nearly all breeds, even though test station standards place little emphasis on loin eye area. Because of the general improvement in gain and feed efficiency, average index values have steadily increased for most breeds.

Introduction

The popularity of swine testing as a means of improving the swine population has greatly increased during the past few years. Testing represents an effort to increase accuracy in selecting for traits that can be measured by testing procedures. The present Oklahoma Swine Test Station was built in 1970 and testing was started in 1971. The Station is intended to secure performance records through which superior individuals and strains may be identified and through which the individual breeder may evaluate the performance of his stock. In this way, the Station provides a pool of tested stock for both purebred and commercial breeders and will assist in the improvement of the performance and quality of Oklahoma market hogs.

The purpose of this report is to describe the change in performance of boars of each breed in the first seven tests of the Oklahoma Swine Test Station.

Materials and Methods

The Oklahoma Swine Evaluation Station was built in 1970 and the first test was conducted in 1971 spring. The station has 24 5 ft. x 15 ft. open front pens with 10 ft. of alumnium slats.

There have been some minor changes in testing procedure since the first test. In general, a swine breeder's entry consisted of a pen of three boars and one barrow or two boars and two barrows. These four pigs were the progeny of one sire. The pigs that made up the spring test in each year were farrowed in February and the fall test pigs were farrowed in August. The pens averaged weighing between 35 and 70 lbs. and were under 80 days of age when delivered to the test station. They were at the test station at least five days before going on test. Those pens not averaging 70 lbs. at the end of the pretest period were put on test at a later

date when the pen averaged 70 pounds. An 18 percent crude protein, ¼ inch pelleted ration was fed until the pen averaged 100 lbs. in weight at which time they were switched to a 16 percent crude protein ration.

Data collected on the boars at the swine evaluation station and the Oklahoma State University Live Animal Evaluation Center when they reached 220 lbs. included rate of gain, pen feed efficiency and a scanogram estimate for loin eye area and backfat thickness. Pen feed efficiency was adjusted to a boar equivalent by assuming that boars required 0.27 pounds less feed per pound of gain than barrows. The backfat measurements were taken approximately 1.5 in. each side of the midline behind the shoulder, at the last rib and at the last lumbar vertebrae. The scanogram estimate of loin eye was taken at approximately the 10th rib. Average backfat thickness and loin eye area were adjusted to a 220 lb. basis with adjustment factors approved by the National Association of Swine Records.

Results and Discussion

The records in these analyses include the 385 boars that completed the seven tests from 1971 spring through 1974 spring. The number of boars of each breed completing each test is shown in Table 1. Beginning with the 1972 fall test, breeders were allowed to test a pen consisting of either two boars and two barrows or three boars and one barrow. This accounts for the increased number of boars in the latter tests.

The average daily gain and feed efficiency for boars of each breed and each test are presented in Table 2. The boars in each pen started on test at an average weight of 70 lbs. and were weighed off test weekly as they weighed 220 lbs.

The overall year and season of test averages presented in the bottom of each of the tables are the averages only for the Duroc, Hampshire and

Table 1. Number of Boars of Each Breed Completing Each Test.

Breed	Year and Season of Test							
	1971S	1971F	1972S	1972F	1973S	1973F	1974S	Total
Berkshire	2	7					3	12
Chester White	6		2	6	3	8	11	36
Duroc	14	16	16	18	24	18	24	130
Hampshire	16	12	14	15	17	15	5	94
Poland	6	5	4					15
Spot			2	7	12	11	12	44
Yorkshire	4	2	8	9	5	15	11	54
Total	48	42	46	55	61	67	66	385

Yorkshire breeds that were represented in each test. From these tables, an estimate can be made of the phenotypic trends that have been occurring since the first test.

There has been a general increase in growth rate over time and a corresponding decrease in the amount of feed required per pound of gain. Some of the improvement in feed efficiency may be attributed directly to two management changes. Between the 1971 fall and the 1972 spring tests new feeders were installed that greatly reduced the amount of feed wastage and in the 1974 spring test, the feeder hole of each feeder was cleaned daily and uneaten feed was weighed back. These changes appear to have reduced feed wastage and resulted in considerable improvement in feed efficiency.

The average backfat thickness and loin eye area for boars of each breed are presented in Table 3. There appears to be relatively little change in backfat thickness over time; however average loin eye area seems to have increased slightly.

The average performance for individual boar index is shown in Table 4. There has been a marked increase in the index since the first test due in part to the increase in growth rate but due primarily to improved feed efficiency.

To better estimate the phenotypic time trends that have occurred since the first test, the breed means for each test were regressed on test number to estimate the average change in performance per test for each trait. These regression coefficients are presented in Table 5.

Average daily gain on test has increased with each test for all breeds except the Polands who had a slight decline in average growth rate for the three tests in which they were represented. Significant average increases per test in growth rate were found only for Berkshires and Chester Whites.

There were no significant changes in average backfat thickness for any breed and the breeds were not consistent in the direction of change in backfat thickness. Chester White and Duroc breeds have had virtually no change in average backfat thickness since the first test. Berkshire, Hampshire and Spot breeds have tended to increase in average backfat while the Poland and Yorkshire breeds have decreased somewhat in average fat thickness.

All breeds, except the Spot breed, have shown a favorable average improvement per test in feed efficiency. The Duroc and Hampshire breeds have had a significant average change per test of $-.05$ and $-.06$ lbs. of feed per lb. of gain, respectively.

All breeds, except the Spots, have had an average increase per test in loin-eye area; however, only the increase of 0.064 sq. in. per test in loin eye area for Hampshires was significant.

Table 2. Average Daily Gain and Feed Efficiency for Boars of Each Breed and Each Test.

Breed	Year and Season of Test[1]														Overall Avg.	
	1971S		1971F		1972S		1972F		1973S		1973F		1974S			
	ADG	FE	ADG	FE	ADG	FE	ADG	FE	ADG	FE	ADG	FE	ADG	FE	ADG	FE
Berkshire	1.91	2.86	1.80	3.04									2.06	2.45	1.92	2.78
Chester White	1.56	2.85			1.73	2.78	1.84	2.67	1.89	2.67	1.90	2.80	1.90	2.50	1.81	2.71
Duroc	2.00	2.84	2.02	2.73	1.95	2.52	1.98	2.56	1.94	2.56	2.03	2.58	2.07	2.50	2.00	2.61
Hampshire	1.79	2.87	2.02	2.76	1.86	2.65	1.99	2.60	1.82	2.71	1.97	2.58	1.99	2.41	1.92	2.65
Poland	1.80	3.09	1.78	3.10	1.77	2.58									1.78	2.92
Spot					1.91	2.59	1.95	2.84	1.93	2.57	2.00	2.96	1.98	2.55	1.95	2.70
Yorkshire	1.82	2.85	1.27	3.01	2.05	2.62	2.03	2.44	1.88	2.72	2.01	2.58	1.99	2.62	1.93	2.69
Overall Avg.[2]	1.87	2.85	1.92	2.83	1.95	2.60	2.00	2.53	1.88	2.66	2.01	2.58	2.02	2.50		

[1] 1971S = 1971 spring test and 1971F = 1971 fall test, etc.
[2] Overall season averages based only on Duroc, Hampshire, and Yorkshire breeds that were represented in every test.

Table 3. Average Backfat Thickness and Loin Eye Area for Boars of Each Breed and Each Test.

Breed	Year and Season of Test[1]														Overall Avg.	
	1971S		1971F		1972S		1972F		1973S		1973F		1974S			
	BF	LEA	BF	LEA	BF	LEA	BF	LEA	BF	LEA	BF	LEA	BF	LEA	BF	LEA
Berkshire	0.88	5.38	1.03	5.86									0.99	6.06	0.97	5.77
ChesterWhite	1.03	5.13			0.99	5.60	0.90	5.57	1.10	5.98	0.99	5.97	0.97	5.54	1.00	5.63
Duroc	1.01	5.30	1.01	5.61	0.97	5.50	0.92	5.41	0.99	5.82	0.98	6.06	1.03	5.62	0 99	5.62
Hampshire	0.77	5.95	0.91	5.85	0.87	5.77	0.79	5.84	0.86	6.16	0.87	6.13	0.91	6.23	0.85	5.99
Poland	1.05	5.45	0.93	5.96	0.86	5.66									0.94	5.69
Spot					0.81	5.96	0.87	5.71	0.95	6.05	0.95	5.99	0.94	5.30	0.90	5.80
Yorkshire	1.15	5.07	1.17	5.71	0.98	5.50	0.90	5.50	1.02	5.61	0.96	5.99	0.95	5.28	1.02	5.52
Overall Avg.[2]	0.98	5.44	1.03	5.72	0.94	5.59	0.87	5.58	0.95	5.86	0.94	6.06	0.96	5.71		

[1] 1971S = 1971 spring test and 1971F = 1971 fall test, etc.
[2] Overall season averages based only on Duroc, Hampshire, and Yorkshire breeds that were represented in every test.

Table 4. Average Index[1] for Boars of Each Breed and for Each Test.

Breed	Year and Season of Test[3]							Overall Avg.
	1971S	1971F	1972S	1972F	1973S	1973F	1974S	
Berkshire	185.2	160.5					207.2	184.3
Chester White	149.4		169.0	185.8	177.9	180.3	193.9	176.1
Duroc	186.4	191.9	197.1	200.4	193.6	200.5	205.4	196.5
Hampshire	181.1	196.8	191.3	207.9	185.6	202.6	208.2	196.2
Poland	157.2	162.9	186.5					168.9
Spot			201.0	190.1	194.3	184.4	200 2	194.0
Yorkshire	162.2	146.6	200.5	211.2	180.8	200.9	197.5	185.7
Overall Avg.[2]	176.6	178.4	196.3	206.5	186.7	201.3	203.7	

[1] Individual boar index = 200 + 80 (ADG) − 60 (BF probe) − 40 (FE)
[2] Overall season averages based only on Duroc, Hampshire and Yorkshire breeds that were represented in every test.
[3] 1971S = 1971 Spring test and 1971F = 1971 Fall test, etc.

Table 5. Average Change in Performance Per Test for Boars of Each Breed.

	Trait				
	Avg. daily gain, lbs.	Backfat thickness, in.	lbs. of feed/lb. gain	Loin eye area, in.[2]	Index
Berkshire	.041*	.009	—.084	.090	5.50
Chester White	.059**	—.003	—.042	.098	6.47*
Duroc	.008	.001	—.050*	.078	2.53*
Hampshire	.017	.012	—.060**	.064*	3.11
Poland	—.016	—.093	—.255	.105	14.65
Spot	.018	.034	.004	—.104	—.80
Yorkshire	.033	—.036	—.052	.046	7.04
Overall Avg.	.017	—.008	—.053*	.063	4.20

* Average change per test is significantly different from zero, $P < .05$.
**Average change per test is significantly different from zero, $P < .01$.

The Spot breed was also the only breed that has not had an average increase per test in index score. Spots have had virtually no change in average index since the first test. Only the Duroc and Chester White breeds have had a significant increase.

When only the three breeds that have been represented in every test are considered, there has been a favorable change per test in each trait measured; however, the only significant change has been for feed efficiency.

The changes observed over time at the test station may be due to several factors. Improved average genetic merit of the pigs on test is only one factor that can contribute to this change. In addition, factors assoc-

iated with improved management will improve performance over time and can not be separated from the genetic differences between pigs of different tests. In addition, differences in performance of pigs of the different breeds do not necessarily reflect breed differences. The relatively small number of animals in some breeds, Polands and Berkshires, for example, leave room for a very large amount of sampling error in these breeds. Also, most pigs that enter the test station are carefully selected and differences in the ability of breeders to select pigs for testing is part of the bias that may exist in breed comparisons of these data. Breeders also learn from past experience and this may be reflected in the average improvement over time for the traits measured.

These data do document the average performance of pigs at the test station and do show a general improvement. Hopefully, most of the improvement is due to improved average genetic merit of the pigs entered into each test. This in turn should result in improved performance of the breeders herd and of herds which purchase breeding stock from breeders who are testing boars. In this way, the Oklahoma Swine Test Station appears to be making an important contribution to improving total efficiency of swine production in Oklahoma.

Performance of Pigs Fed Least Cost Computer Rations

W. G. Luce and C. V. Maxwell

Story in Brief

A trial was conducted to study the performance of pigs fed least cost computer rations as compared to a grain sorghum-soybean meal control ration. Treatments involved were (1) a basal grain sorghum-soybean meal ration (2) a least cost computer ration fed throughout the trial and (3) a least cost computer ration reformulated every 29 days using current prices of the feed ingredients available.

Pigs on treatment 1 (the grain sorghum-soybean meal control ration) tended to have higher daily gains, require less feed per pound of gain, and have a higher average daily feed intake. The generally decreased per-