HETEROSIS AND BREED EFFECTS FOR FOUR BREEDS OF SWINE: 1.POSTWEANING PERFORMANCE

D.G. McLaren[1], D.S. Buchanan[2] and R.K. Johnson[3]

Story in Brief

Individual heterosis and breed effects for postweaning average daily gain, off-test age and probed backfat thickness were estimated from data on 1,664 pigs produced by all possible purebred and two breed cross matings involving the Duroc, Yorkshire, Landrace and Spotted breeds. Specific heterosis estimates for average daily gain and off-test age were highly significant and reasonably consistent between crosses. Overall heterosis estimates were .15 lb/day (10.5%) for average daily gain, -14 days (7.5%) for off-test age and .03 in (3.2%) for backfat thickness. Duroc and Spotted sired pigs grew faster and were younger off-test than Yorkshire and Landrace sired pigs. Landrace sired pigs probed fatter, and Duroc sired pigs leaner than pigs with Spotted or Yorkshire sires. Breed of dam effects for average daily gain were similar to breed of sire effects. Overall these results indicated the importance of heterosis for growth rate, and the relative advantage of the Duroc for faster, leaner postweaning gain.

(Key Words: Swine, Growth Rate, Probed Backfat, Heterosis, Breed Differences.)

Introduction

Crossbreeding is widely used in commercial swine enterprises. Its benefits are heterosis, the advantage of the crossbred over the average of the respective purebreds, and breed complementarity, the optimum combining of breeds so that the outstanding characteristics of each breed will be expressed.

There has been extensive research on the effects of heterosis and evaluation of some breeds of swine. The available information on breeds such as the Spotted and Landrace breeds is not as plentiful. A project aimed at evaluating purebred and crossbred performance of Duroc, Yorkshire, Landrace and Spotted breeds of swine was conducted at the Oklahoma Agricultural Experiment Station between 1976 and 1979. As part of this project purebred and two breed cross litters were produced over five consecutive farrowing seasons starting in the fall of 1976 at the Experimental Swine Farm, Stillwater.

Purebred and crossbred litter performance results have been reported previously (Gaugler et al, 1984). This report will summarize the postweaning performance data from pigs farrowed during the fall of 1976 and the spring and fall of 1977 and 1978 at Stillwater.

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[1]Former Graduate Assistant [2]Associate Professor [3]Professor, University of Nebraska

Materials and Methods

Purebred Duroc, Yorkshire, Landrace and Spotted males and females were mated in all possible combinations to produce purebred and two-breed cross offspring. Foundation boars and gilts of each breed were obtained from several different sources, and semi-annual introduction of at least one new boar of each breed was practiced in order to maintain a broad genetic base in the purebred herds. Each purebred herd consisted of seven to nine boars and 30 to 35 females.

Boars were randomly mated to at least one female of each purebred type. Distribution of animal numbers by breed group is given in Table 1. Spring litters were farrowed in March and April, fall litters in September and October. Pigs had access to creep feed from between 2 and 3 weeks of age, and were weaned at approximately 6 weeks of age. The two heaviest boars at weaning from at least four litters of each breed group were left intact. All other males were castrated. At approximately 8 weeks of age, barrows and some of the gilts were moved to pasture lots, stocking approximately 50 pigs per lot. The remaining gilts were randomly allotted within litter to be grouped in pens of 10 and fed in an open-front confinement building adjacent to pens containing the boars.

Pigs were fed a 14% crude protein corn or sorghum grain based diet from approximately 8 weeks of age until the end of the test period. Gilts were weighed off-test and probed for backfat thickness at approximately 200 lb. Boars and barrows were weighed off-test and probed at approximately 220 lb. Complete gain-test records (average daily gain, off-test age and probed backfat thickness) were collected on 976 gilts, 403 boars and 285 barrows. The data were analyzed using a procedure which allowed estimation of breed and crossbred group means while accounting for the effects of litter, year-season farrowed, sex and parity of the dam as well as some two factor interactions.

Table 1. Number of pigs by breed group.

	Breed of dam			
Breed of sire	D	Y	L	S
Duroc (D)	125	85	110	102
Yorkshire (Y)	107	93	108	90
Landrace (L)	101	87	142	87
Spotted (S)	107	109	102	109

Results and Discussion

Heterosis estimates are given in Table 2. Specific estimates for average daily gain and off-test age were all highly significant and reasonably consistent between crosses. Although specific estimates for probed backfat thickness were not significantly different from zero,

Table 2. Individual heterosis estimates for postweaning performance.

Reciprocal crosses	Average daily gain lb/day	(%)	Off-test age days	(%)	Probed backfat in.	(%)
D x Y	.17**	(12.0)	-16.2**	(-8.6)	.031	(3.1)
D x L	.16**	(11.3)	-14.4**	(-7.7)	.033	(3.2)
D x S	.16**	(10.7)	-13.1**	(-7.1)	.048+	(4.8)
Y x L	.12**	(8.5)	-11.9**	(-6.2)	.040+	(3.9)
Y x S	.13**	(9.3)	-12.9*	(-6.8)	.015	(1.5)
L x S	.16**	(11.0)	-16.4**	(-8.8)	.029	(2.7)
Overall	.15**	(10.5)	-14.1**	(-7.5)	.033*	(3.2)

[a]D=Duroc, Y=Yorkshire, L=Landrace, S=Spotted.
+P<.10
*P<.05
**P<.01

overall heterosis was significant. Overall performance of crossbreds as a deviation from the contemporary purebred mean was .15 lb/day (10.5%) for postweaning average daily gain; -14 days (7.5%) for off-test age and .03 in (3.2%) for probed backfat thickness.

Breed of sire and breed of dam effects for postweaning performance traits are given in Table 3. Duroc and Spotted sired pigs gained approximately .04 lb/day faster, and reached off-test weight approximately 4.5 days earlier, than Yorkshire and Landrace sired pigs. Landrace sired pigs probed 1.05 in fatter than pigs with Duroc sires, with Yorkshire and Spotted sired pigs somewhat intermediate. Breed of dam effects for average daily gain, apart from a nonsignificant change

Table 3. Breed effects[a] for postweaning traits.

	Average daily gain, lb/day	Off-test age, days	Probed backfat, in
Overall mean	1.547	177.15	1.046
		Breed of sire	
Duroc	.026	-2.03	-.057
Yorkshire	-.018	2.64	-.009
Landrace	-.026	1.90	.048
Spotted	.019	- 2.51	.017
		Breed of dam	
Duroc	.021	-2.56	.026
Yorkshire	-.021	3.89	-.029
Landrace	-.013	-0.29	.019
Spotted	.013	-1.04	-.016

[a]Breed group averages, as deviations from the overall mean.

in rank between Yorkshire and Landrace, were similar to breed of sire effects. Pigs with Duroc dams took 6.5 fewer days to reach final weight than those with Yorkshire dams. Pigs with Spotted and Landrace dams were approximately 2 days older off-test than those with Duroc dams. Breed of dam differences were not significant for probed backfat thickness.

Results of this study indicated a moderate crossbred advantage for postweaning average daily gain and for age off-test, with low individual heterosis for probed backfat thickness. The superiority of Duroc sired pigs for average daily gain and probed backfat thickness suggests utility of the Duroc as a sire breed. While Spotted sired pigs gained well they were also fat.

Gaugler et al. (1984) reported Landrace and Yorkshire to be superior for litter productivity traits, relative to Duroc and Spotted dams. Taken in conjunction with these results, the finishing data provided further support for use of the Yorkshire and Landrace as dam breeds in crossbreeding systems involving the Duroc. Such crosses produced leaner pigs when the Yorkshire and Landrace were used as the dam breed.

Literature Cited

Gaugler, H. R. et al. 1984. Sow productivity comparisons for four breeds of swine:Purebred and crossbred litters. J. Anim. Sci. 59:941.