

Reproductive Performance of Duroc, Hampshire and Yorkshire Females When Producing Purebred and Crossbred Litters

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Story in Brief

This study was initiated to evaluate the reproductive performance of purebred Duroc, Hampshire and Yorkshire females when bred to produce purebred or crossbred litters. The records of 222 gilts slaughtered 30-days postbreeding, the farrowing records of 452 sows and gilts and the records of 135 females failing to conceive were analyzed.

Duroc and Yorkshire gilts ovulated 1.55 and 1.23 more eggs, respectively, than Hampshire gilts. There was a marked difference between breeds in the percentage of females that had reproductive failures. Of the Yorkshire gilts selected to be mated, 24.4 percent had reproductive failures compared to 17.6 percent and 6.9 percent for Duroc and Hampshire gilts, respectively. The percentage of reproductive failures for the sows retained for breeding was 28.2 percent for Yorkshires, 13.9 percent for Durocs and 9.7 percent for Hampshires. There were no significant differences between purebred and crossbred litters within any breed of dam in the number of embryos, embryo survival rate or embryo length 30-days postbreeding.

Number of pigs farrowed, birth weights and 42-day weights also showed little response to crossbreeding. The single greatest response to crossbreeding was in survival rate from birth to weaning. Crossbred litters were significantly larger (0.83 pigs) and heavier (23.8 lbs.) than purebred litters at weaning. These increases were most evident for Duroc and Hampshire dams while Yorkshire dams showed little response to crossbreeding. On the average Yorkshire dams weaned litters that were 1.5 pigs larger and weighed about 30 lbs. more than did Duroc and Hampshire dams while there was little difference between Durocs and Hampshires.

Introduction

Today the major portion of market pigs in the United States are produced by crossing two or more breeds of swine in order to take advantage of heterosis in many of the economically important traits. Early research has fairly well established that sow productivity is one of the

traits that respond well to crossbreeding. However, information on the combining ability of the modern U.S. swine breeds is lacking.

In 1969, Project 1444 was initiated at the Oklahoma Experiment Station to evaluate the combining ability of the Duroc, Hampshire and Yorkshire breeds. Phase I of this study was initiated to evaluate the reproductive performance of the three pure breeds when bred to produce purebred or crossbred litters. The reproductive performance of gilts from five seasons of Phase I matings are summarized in this report.

Materials and Methods

In the fall of 1973 the last farrowing of Phase I of the Oklahoma swine breeding project being conducted at the Fort Reno Experiment Station was completed. This phase of the project was involved with determining the effect that using a boar of a different breed has on the reproductive performance of purebred Duroc, Hampshire and Yorkshire dams.

In the fall of 1969, the three purebred seedstock herds were formed by obtaining 25 gilts and 5 boars of each breed. The initial breeding stock came from as many different lines of breeding within each breed as possible. From the purebred litters produced at Stillwater in 1970 spring, 54 gilts and 6 boars from each breed were selected after they completed a feeding test and were taken to Fort Reno for breeding in 1970 fall. Each boar was mated to 3 gilts of his own breed and to 3 gilts of each of the other two breeds. This mating system was repeated again in 1971 spring, 1972 fall and 1973 spring. About half of the gilts bred in 1970 fall and 1972 fall were selected to be bred again in 1971 spring and 1973 spring, respectively. Thus, in the latter two seasons each boar was bred to 2 gilts and one sow of each breed. Because of management problems in the fall of 1971 farrowing, there were excessive post farrowing losses, and sows and gilts that farrowed in 1971 fall were remated to farrow in summer 1972. These sows were randomly mated to a new set of boars. All sow records were adjusted to a gilt basis.

Approximately 30 days after breeding, one gilt from each mating type for each boar was randomly selected to be slaughtered to evaluate ovulation rate and early embryo development. No sows were slaughtered.

All sows in this experiment were randomly assigned to breeding pens of 16 sows per pen, limited fed and farrowed in confinement. During breeding, sows were checked for heat by use of a teaser boar and were hand mated. Whenever possible repeat matings were made between 12 and 24 hours after the first service. Each sow was moved with her litter from the farrowing barn to a nursery at about 3-5 days after farrowing.

Each sow and litter was penned separately and pigs were given access to creep feed after 21-day weights were taken and were weaned at 42 days of age.

Results

The distribution of the reproductive failures of the 818 gilts and sows evaluated in this study are reported by breed in Table 1. All gilts were between 210 and 270 days of age at the beginning of the breeding season and the breeding season was long enough to allow problem breeders to have at least three complete cycles.

Among the 603 gilts evaluated the failure rate over all breeds was 19.4 percent. The failure rates for Duroc and Yorkshires (17.6 and 24.4 percent, respectively) were not significantly different from each other but were higher than the failure rate for Hampshires (6.9 percent). This relationship changed slightly among the sows where the failure rate over all breeds was 13.4 percent. In the sows, the Yorkshires had a significantly higher failure rate (28.2 percent) than the Hampshires or Durocs (13.9 and 9.7 percent, respectively) and the difference between Duroc and Hampshire was not significant.

Table 1. Reproduction Efficiency and Ovulation Rate by Breed of Sow.¹

	Breed of Dam		
	Duroc	Hampshire	Yorkshire
Reproductive Efficiency:			
Gilt Data			
No. selected for breeding	204	202	197
No. pregnant at end of season	168	188	149
No. failing to reproduce	36	14	48
Failure rate, %	17.6a	6.9b	24.4a
Sow Data			
No. selected for breeding	72	72	71
No. sows that farrowed	62	65	51
No. sows failing to farrow	10	7	20
Failure rate, %	13.9a	9.7a	28.2b
Overall			
Total no. selected for breeding	276	274	268
No. pregnant at end of season	230	253	200
No. failing to reproduce	46	21	68
Failure rate, %	16.7	7.7	25.4
Ovulation rate for gilts slaughtered			
No. gilts slaughtered	75	84	63
No. corpora lutea per gilt	14.05a	12.50b	13.73a

¹ Any means in a row with different superscripts are significantly different from each other ($P < .05$).

The differences in failure rate between breeds does not appear to be due to differences in sexual maturity since all gilts were between 210 and 270 days of age at the beginning of the breeding season and the same general trend was observed among the sows. These data suggest that different numbers of females of each breed should be retained for breeding if a specific number are to be farrowed.

The breed of boar a gilt is mated to should not affect her ovulation rate which is measured by the number of corpora lutea on the ovaries. The number of corpora lutea per gilt are reported at the bottom of Table 1 by breed of gilt. Duroc and Yorkshire gilts ovulated at essentially the same rate (14.05 and 13.7 corpora lutea, respectively) and at a significantly higher rate than Hampshires (12.50 corpora lutea).

The results on early embryo development are given in the top of Table 2. Using a boar of a different breed had little effect on the number of embryos per gilt, the percent eggs ovulated represented by normal embryos or average embryo length for any breed of dam. Within any breed of dam, there were no significant differences between breeds of boar used to produce crossbred litters for any embryo development traits. Averaged over all breeds of sire (Table 4), Yorkshire and Duroc dams averaged 2.06 and 1.74 more embryos than did Hampshires. Yorkshire dams had a higher percent of eggs represented by embryos than did Hampshire dams and the embryos from Yorkshire dams averaged 1.15 and 1.36 mm. less in length than did embryos from Duroc and Hampshire dams, respectively.

Table 2. Breed Group Means and Standard Errors and Specific Comparison for Litter Traits of Gilts Slaughtered 30-Days Post-breeding.

Breed Group ¹	Number Slaughtered	Number of live embryos/gilt	Percent live embryos of corpora lutea	Avg. embryo length per gilt
DxD	25	10.84±.55	79.63±3.85	25.98±.47
HxD	21	11.10±.60	78.71±4.20	27.17±.52
YxD	29	10.86±.51	77.14±4.30	25.69±.44
HxH	30	8.93±.50	72.24±3.51	26.73±.43
DxH	26	9.35±.54	76.54±3.77	26.58±.46
YxH	28	9.29±.52	77.97±3.63	26.16±.45
YxY	22	11.23±.58	84.03±4.10	24.58±.50
DxY	24	11.29±.55	83.47±3.93	25.79±.48
HxY	17	11.24±.66	81.42±4.66	25.01±.57
D/cross - D/pure		.14±.67	-1.71±4.71	.45±.58
H/cross - H/pure		.39±.62	5.02±4.38	-.36±.54
Y/cross - Y/pure		.03±.72	-1.59±5.08	.82±.62
Cross - Pure		.19±.38	.58±2.71	.31±.33

¹ D = Duroc, H = Hampshire, Y = Yorkshire.

The litter records are summarized in Table 3. Crossbred litters were not significantly larger at birth for any breed of dam; however, crossbred litters did average $0.33 \pm .27$ more pigs at birth than did purebred litters. There were 13.8 percent more pigs weaned in crossbred than in purebred litters. This difference was mainly due to the increase of $1.58 \pm .43$ and $1.12 \pm .43$ pigs in crossbred litters over purebred litters from Duroc and Hampshire dams, respectively. Average pig weights at birth and 42 days showed no response to crossbreeding.

At birth crossbred litters from Duroc dams were significantly heavier (2.54 lbs.) than their purebred counterparts; however, this situation did not appear to be present in Hampshire and Yorkshire dams. Litter weight at 42 days was significantly larger for crossbred litters than for purebred litters. Most of this response due to crossbreeding occurred in Duroc and Hampshire dams whose crossbred litters averaged 41.0 ± 10.5 lbs. and 35.0 ± 10.5 lbs. heavier, respectively, than did purebred litters.

Using a sire of a different breed increased survival rate from birth to weaning by 9.07 ± 2.47 percent. This increase in liveability was evident only for Duroc and Hampshire dams where crossbred litters averaged 11.24 ± 4.25 percent and 17.52 ± 4.17 percent higher survival rate than did their purebred counterparts. Yorkshire females showed little response to crossbreeding for any traits evaluated.

Duroc dams mated to Hampshire boars averaged fewer pigs per litter at birth (1.29 pigs) and 42 days (0.78 pigs) and averaged lighter litters at birth (2.22 lbs.) and 42 days (21.69 lbs.) than did Duroc females mated to Yorkshire boars. The difference in litter size at birth and 42 days and litter weight at 42 days was significant. A similar situation was observed among Yorkshire females. Those that were mated to Hampshire boars averaged smaller litters at birth and 42 days (0.94 and 1.46 pigs, respectively). Litter weight at weaning for Hampshire x Yorkshire litters was 23.91 lbs. lighter than litter weight at weaning for Duroc x Yorkshire litters. Only the 1.46 pig difference in number of pigs at 42 days was significant. This suggests that the response to crossbreeding exhibited by gilts of a specific breed may also depend on the breed of boar to which she is mated. Two-breed cross litters are also produced in Phase II of this project which will provide additional information in this area.

The data in Table 4 shows that when averaged over all breeds of boar Duroc and Yorkshire females averaged 1.36 and 1.48 more pigs farrowed, respectively, than did Hampshire females. Pigs out of Yorkshire dams averaged about 0.45 lbs. lighter at birth than pigs out of Hampshire and Duroc females and Yorkshire dams weaned 1.48 more pigs and had heavier litters at weaning than did Duroc and Hampshire dams. Duroc litters had a significantly lower survival rate (61.8 percent) than Hampshire or Yorkshire litters (70.1 and 73.4 percent, respectively).

Table 3. Breed Means and Standard Errors and Specific Comparisons for Number of Pigs, Avg. Pig Weight and Litter Weight at Birth and 42-Days.

Breed Group	Number Farrowed	No. pigs/litter		Avg. pig wt.		Litter weight		% Survival
		Birth	42 days	Birth	42 days	Birth	42 days	
DxD	55	9.34±.38	5.01±.34	2.79±.07	22.24±.63	25.11± .95	110.55± 8.32	54.36±3.39
HxD	44	9.46±.42	6.20±.38	2.88±.08	23.15±.71	26.54±1.06	140.74± 9.30	64.78±3.79
YxD	53	10.75±.38	6.98±.34	2.73±.07	22.98±.64	28.76± .97	162.43± 8.47	66.41±3.46
HxH	57	8.46±.37	5.31±.33	2.75±.07	22.97±.62	22.94± .93	122.58± 8.17	59.22±3.33
DxH	52	8.44±.39	6.11±.35	2.92±.07	25.28±.65	24.06± .98	154.28± 8.56	73.47±3.49
YxH	56	8.56±.37	6.75±.33	2.90±.07	23.68±.63	24.60± .94	160.87± 8.24	80.01±3.36
YxY	49	10.18±.40	7.69±.36	2.42±.08	23.25±.67	24.21±1.01	176.19± 8.81	74.39±3.69
DxY	46	10.86±.41	8.20±.37	2.26±.08	22.70±.69	24.42±1.04	183.43± 9.10	76.11±3.71
HxY	40	9.92±.44	6.74±.39	2.47±.08	23.94±.74	24.39±1.11	159.62± 9.75	69.57±3.98
D/Cross - D/Pure		.76±.47	1.58±.43*	.01±.10	.82±.80	2.54±1.19*	41.03±10.50**	11.24±4.25
H/Cross - H/Pure		.04±.46	1.12±.43*	.16±.09	1.51±.80	1.39±1.15	35.00±10.50**	17.52±4.17
Y/Cross - Y/Pure		.21±.50	-.22±.45	-.06±.10	-.02±.84	0.20±1.26	-4.67±11.12	1.55±4.51
Cross - Pure		.33±.27	.83±.25*	.04±.05	.80±.47	1.37± .69*	23.79± 6.17**	9.07±2.41

*P < .05

**P < .01