

# **GENETICS—ANIMAL BREEDING**

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## **Age and Weight at Puberty for Purebred and Crossbred Gilts**

**L. K. Hutchens, R. L. Hintz and R. K. Johnson**

### **Story in Brief**

Data from 737 purebred and crossbred gilts of Duroc, Yorkshire, Landrace and Spot breeding farrowed during fall, 1976, spring and fall, 1977, and spring, 1978, were collected. All gilts were self-fed on pasture or in confinement until they reached 200 lb at which time they were weighed off test and placed in pasture lots. After placement in pasture lots, gilts were checked daily for estrus activity with the aid of a teaser boar. For this study, puberty was defined as a gilt's first detectable estrus as indicated by a standing response when mounted by a teaser boar.

Crossbred gilts were younger (7.9 days) and heavier (2.6 lb) at puberty than purebreds. Duroc-Landrace and all crosses involving Spot breeding were significantly younger at puberty than their respective purebred averages. Spring-born gilts were younger at puberty than fall-born gilts. Gilts fed in confinement adjacent to boars were younger at puberty (5.5 days) than gilts fed on pasture with barrows. Differences in weight at puberty due to season effects varied with management system and year.

### **Introduction**

Age at puberty in gilts is a growing concern since interest in maximizing productivity has increased as swine production has intensified. Reducing the age when gilts are bred without reducing their performance can result in savings in both feed and labor. Some environmental factors which have been found to influence age at puberty include nutrition level, season of birth, fenceline contact between gilts and boars, different mixtures of gilts and housing.

The knowledge of genetic factors for age at puberty is also important. Accurate estimates of heritability will indicate the effectiveness of selection for reduced age at puberty. Previous research has shown genetic difference between breeds and heterosis are important for reproductive performance. However, little information on age and weight at puberty is available.

Therefore, the purpose of this study was to compare purebreds and crossbreds of Duroc, Yorkshire, Landrace and Spot breeding for age and weight at puberty. This information will be valuable when evaluating the overall efficiency of different production and crossing systems.

### **Experimental Procedure**

The data were obtained from 737 gilts which were purebred and two-breed crosses of Duroc, Spot, Yorkshire and Landrace breeding. The gilts were raised at the Stillwater Experimental Swine Farm during fall, 1976, spring, 1977, fall, 1977, and spring, 1978. Each season boars were mated at random to at least one female of each of the four breeds (Table 1).

**Table 1. Number of litters of each mating type produced during each season at the Stillwater Experimental Swine Farm**

Breed of sire	Number of sires	Breed of dam			
		D	Y	L	S
Duroc (D)	4	6	4	4	4
Yorkshire (Y)	4	4	6	4	4
Landrace (L)	4	4	4	6	4
Spot (S)	4	4	4	4	6

All pigs were farrowed in a central farrowing unit and weaned at six weeks of age. Creep was provided at approximately three weeks of age. Approximately two weeks after weaning, gilts were randomly allotted within litters to either pasture lots or confinement pens for finishing. All gilts were self-fed until they reached 200 lb at which time they were weighed off test, probed for backfat and placed in pasture lots. After placement in pasture lots, gilts were checked daily for estrus activity with the aid of a teaser boar. For this study puberty was defined as a gilt's first detectable estrus as indicated by a standing response when mounted by a teaser boar. Age and weight were recorded when a gilt's first estrus was detected. Each season gilts were checked daily until the youngest gilts were 219 days of age. Eighty-two out of 819 gilts (10 percent) were not detected by the time the youngest gilts were 219 days of age. Gilts which displayed obvious signs of disease or lameness before reaching 219 days of age were omitted from the analyses.

## Results and Discussion

Crossbreds (189.4 days) were significantly younger than purebreds (197.2 days) at first observed estrus (Table 2). Crossbreds were 2.6 lb heavier than the purebreds. The percentage of gilts never observed in estrus was lower among crossbreds (7.8 percent) than among purebreds (16.4 percent).

Breed of sire and breed of dam interaction significantly affected age and weight at puberty. Since differences between reciprocal crosses for either age or weight at puberty were not significant, the reciprocal crosses were combined (Table 2).

All crosses had an advantage over their respective purebred average (measure of heterosis) for age at puberty. This crossbred advantage was significant for all crosses

**Table 2. Average performance for gilts of each breed group<sup>1</sup>**

Breed group <sup>2</sup>	Number detected	Age at puberty (days)	Weight at puberty (lb)	Number undetected <sup>3</sup>
Duroc (D)	43	201.2 <sup>d</sup>	215.0 <sup>ab</sup>	19
Yorkshire (Y)	34	198.9 <sup>abcd</sup>	200.4 <sup>ab</sup>	8
Landrace (L)	54	194.5 <sup>abcd</sup>	197.6 <sup>a</sup>	5
Spot (S)	47	194.3 <sup>abcd</sup>	205.3 <sup>a</sup>	3
DxY	88	197.3 <sup>ac</sup>	216.4 <sup>ab</sup>	9
DxL	99	183.5 <sup>bd</sup>	201.5 <sup>b</sup>	9
DxS	99	185.0 <sup>a</sup>	206.7 <sup>a</sup>	0
YxL	85	196.0 <sup>abcd</sup>	208.9 <sup>ab</sup>	12
YxS	94	189.1 <sup>ab</sup>	207.4 <sup>a</sup>	11
LxS	94	185.4 <sup>bcd</sup>	202.3 <sup>ab</sup>	6

<sup>1</sup>Means in the same column that do not share at least one superscript differ statistically ( $P < .05$ ).

<sup>2</sup>Reciprocals combined (DxY = DxY and YxD).

<sup>3</sup>Number of gilts which were not observed in estrus. Youngest gilts were 219 days of age when estrus detection was terminated.

except Duroc-Yorkshire and Landrace-Yorkshire crosses. The Duroc-Landrace cross had the largest heterosis advantage (14.3 days) for age at puberty, and all crosses involving Spot breeding had a notable advantage over their respective purebred averages.

All crosses were heavier than their respective purebred averages for weight at puberty except the Duroc-Landrace cross. The difference between the Landrace-Yorkshire cross and their respective purebred average (9.9 lb) was the only significant heterosis effect for weight at puberty.

Gilts raised in confinement (188.6 days) during the finishing phase were significantly younger at puberty than gilts raised on pasture (194.1 days). A significant interaction between management system and season affected weight at puberty. Spring-born gilts raised on pasture were heavier at puberty (207.3 lb) than fall-born (202.2 lb). However, no notable season effect existed in gilts raised in confinement (201.1 lb in the fall vs. 198.7 lb in the spring). Comparisons among management systems should be viewed carefully because gilts in confinement were penned adjacent to boars of similar age and gilts on pasture were penned with barrows.

**Table 3. Average performance for gilts born during different year-seasons**

Year-season	Age at puberty (days)	Weight at puberty (lb)
1976 - Fall	195.0	206.6
1977 - Spring	188.6	214.8
1977 - Fall	198.8	205.5
1978 - Spring	183.3	199.8

A significant interaction between year and season existed for age and weight at puberty (Table 3). Spring-born gilts were 6.4 days younger in the first year and 15.3 days younger in the second year. Spring-born gilts were 8.2 lb heavier in the first year and 5.7 lb lighter in the second year.

Breed differences for age at puberty are indicated in these data. The information on the breed comparisons should aid in evaluating the efficiency of production systems.

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## Relationship Between Pubertal and Growth Characteristics in Gilts

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Data from 737 crossbred and purebred gilts of Duroc, Landrace, Yorkshire and Spot breeding were used to estimate the heritability of age and weight at puberty and their genetic and phenotypic correlations with birth weight, weaning weight, post-weaning daily gain, adjusted age at 200 lb and adjusted backfat thickness at 200 lb.

The paternal half-sib heritability estimate for age at puberty was .19. The genetic and phenotypic correlations between age at puberty and birth weight, weaning weight,