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The Effects of Genetic Line and Diet Regimen on Attainment of Puberty in Gilts*

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Summary and Implications

A trial was conducted to determine the effects of genetic line and gilt development diet regimen and the interaction of these factors on the timely attainment of puberty in gilts. Genetic line was an important factor on the probability of gilts attaining puberty by 8.5 months. Results also indicated leaner gilts (as measured by backfat adjusted to 240 lb) had a lower probability of reaching puberty by 8.5 months than fatter gilts. Gilt development diet regimen and the interaction between genetic line and diet regimen were not significant effects on the attainment of puberty by 8.5 months of age. These results suggest genetic line-specific feeding programs are not necessary for early attainment of puberty.

Introduction

Timely attainment of puberty, the first estrous cycle in gilts, is economically important to a swine operation. With earlier puberty, nonproductive days (from gilt selection to mating) are reduced and gilts can enter the production flow of a swine operation sooner. Additionally, producers can breed gilts on the second or third post-pubertal estrus, rather than on the pubertal estrus, to meet farrowing goals. Mating gilts at second or third estrus can increase litter size at first parity.

Several factors have been suggested to influence age at puberty, including genetics, nutrient content of the diet, feeding levels, reaching a threshold fat/lean ratio in growth, season and level of boar exposure. Most breeding organizations recommend specific gilt development feeding programs for their genetic lines. The purpose of this study was to investigate whether genetic line x gilt development diet interactions exist for timely attainment of puberty in gilts.

Materials

Data for this study came from the National Pork Producers Council's Gilt Development Project. Seven hundred and eight gilts from five genetic lines were assembled using Segregated Early Weaning (SEW) procedures at the Minnesota Pork Producers Association (MPPA) SEW station at Waseca,

Table 1. Number of gilts entering breeding pens by genetic line-diet subclass

	Diet[a]		
Genetic line	1	2	3
A	41	52	40
B	42	40	52
C	44	52	40
D	50	39	39
E	46	40	40

[a]1 = 18% crude protein corn-soybean meal diet provided ad libitum until 250 lb; 2 = 13% crude protein corn-soybean meal 5% added fat diet provided ad libitum until 250 lb; 3 = 21% crude protein corn-soybean meal diet provided ad libitum from 150 to 180 lb and 18% crude protein corn-soybean meal diet fed at 4 lb/day from 180 lb to 180 days of age.

Table 2. Probability of attaining puberty by 8.5 months of age for different genetic lines and diet regiments[a]

Item	Prob. of Puberty	SE[b]
Genetic line		
A	.78 [a*]	.04
B	.70[a,b]	.04
C	.55[c*]	.04
D	.63[b,c]	.04
E	.71[a,b]	.04
Diet[c]		
1	.68	.03
2	.67	.04
3	.68	.03

[a]Estimates with different superscripts differ (P<.05); * = differences P<.001.
[b]Standard error of the mean.
[c]1 = 18% crude protein corn-soybean meal diet provided ad libitum until 250 lb; 2 = 13% crude protein corn-soybean meal 5% added fat diet provided ad libitum until 250 lb; 3 = 21% crude protein corn-soybean meal diet provided ad libitum from 150 to 180 lb and 18% crude protein corn-soybean meal diet fed at 4 lb/day from 180 lb to 180 days of age.

Minnesota. The range in the gilts age was nine days. Lines were chosen to represent a range in body compositional makeup (lean and fat growth rates) and reproductive rates for current genetics available in the U.S. The populations of pigs sampled represented F_1 Hampshire-Duroc, F_1 Yorkshire-Landrace, F_1 Large White-Landrace and two different sources of a three-way cross between Large White, Landrace and Duroc.

When gilts reached 40 to 45 lb, they were moved to the MPPA Swine Testing Station, where they were fed a grower diet (21 percent crude protein) to an average pig weight of 150 lb (approximately 120 days of age). Gilts were then assigned to one of three gilt development diet regimens. These were: 1) ad-libitum feeding of a high protein (18%) corn-soybean meal diet, until they weighed 250 lb, 2) ad-libitum feeding of a low protein (13%), corn-soybean meal diet containing 5 percent added fat until they weighed 250 lb and 3) restricted feeding (4 lb/day) of a high protein (18%), corn-soybean meal diet from 180 lb to 180 days of age. Gilts provided diet regime 3 were given ad libitum access to a 21 percent crude protein grower diet from 150 to 180 lb.

At 180 days, the gilts were moved to a modified open front facility at the station and penned by weight and genetic line. Six hundred fifty-seven gilts entered these pens. The number of gilts per genetic line/diet subclass is shown in Table 1. Gilts were exposed in their own pen and by fenceline contact to young boars once daily. Estrus was detected by using the back pressure test in the presence of a boar. At approximately 200 days, gilts were scanned for backfat with real time ultrasound. Backfat was adjusted to 240 lb using equations in the 1996 Guidelines for Uniform Swine Improvement Programs, National Swine Improvement Federation. Attainment of puberty was scored as: 1 - gilts detected in standing estrus by 8.5 months of age, or 0 - gilts not detected in estrus by 8.5 months of age. Analysis of the data used logits, log [probability of event/(1-probability of event)] and the model included the effects of genetic type, diet regimen and their interaction. A second analysis was done which fit backfat, adjusted to 240 lb, as a covariate in the above model.

Results

The effect of genetic line was significant (P<.001), and gilt development diet and the interaction between genetic line and diet were not important effects for any traits in this analysis. Table 2 presents the estimated probabilities of attaining puberty by 8.5 months of age for the different genetic lines and diet regimes in the trial. Line C had the lowest probability of attaining puberty by 8.5 months of age, line D the highest probability and lines A, B and E were intermediate. The probability of attaining puberty by 8.5 months of age was not affected by how the gilts were fed.

The amount of backfat (adjusted to 240 lb) for gilts in this trial ranged from .40 inch to 1.63 inch. Results of the effect of backfat on attainment of puberty by 8.5 months were in the form of odds ratios. Odds are the probability of an event occurring divided by the probability of it not occurring (odds=P/(1-P)). An odds ratio is the ratio of odds at two different values for the covariate (for example, at .6 inch of backfat and .8 inch of backfat). Results showed that when averaged over all genetic lines and diets, an increase of .2 inch of backfat increased the probability of gilts attaining puberty by 8.5 months of age by approximately 10 percent.

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