Influence of Timing of Insemination on Conception Rate and Litter Size in Gilts

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ASL-R1578

Summary and Implications

Two different genetic lines and three timings of insemination were evaluated to determine the best insemination time for gilts that ensures high conception rate and high number of piglets born in the litter. Different genetic lines may require different timings of insemination.

Introduction

Swine production has become highly competitive. To stay efficient in this industry, producers must continuously look for methods to increase production with emphasis on cost reduction. One of these methods is artificial insemination (AI) that in many ways, helps to improve profitability:

- with AI, the cost of using superior sires can be spread over more sows;
- more rapid improvement in the traits that result in greater profits is possible because of wider boar selection available;
- AI allows the producers to use fewer high quality boars than is possible with natural service;
- AI can help reduce animal exposure to some diseases;
- on commercial farms AI can reduce breeding time and labor demands by cutting costs as much as 50% compared with hand mating.

To be beneficial artificial insemination has to be done properly. There are many factors involved in quality of AI performance, including insemination technique, technician, semen quality, cleanliness, etc. The single most important factor in achieving high conception rate and good litter size is the timing of service relative to the timing of ovulation. To achieve maximum fertility in sow herds insemination must occur early enough in estrus so that sperm cells are in the vicinity and ready to fertilize the eggs upon ovulation. Time of ovulation, which is variable, appears to correlate with the weaning-to-estrus interval and duration of the estrus. The length of the estrous cycle in swine varies from 18–24 days, with 20–21 days being the most common. Gilts normally remain in estrus for 36–48 hours whereas sows usually remain in estrus 60–70 hours. Ovulation occurs 36–40 hours after the onset of estrus in most animals with a range of 24–72 hours. Maximum fertilization will occur if sperm is deposited in the oviduct approximately 12 hours before ovulation. When mating occurs too early or too late relative to ovulation, conception rate drops very rapidly.

If the exact timing of the beginning of standing heat could be known precisely, then the female could be bred 24 hours after the onset of estrus to ensure maximum fertility. As the exact time of the onset of ovulation is not known, best results are obtained by breeding twice or more at 12-hour intervals as long as the female will stand to a boar.

Differences in length of estrus and timing of ovulation between gilts and older sows have been noticed. Most producers, due to labor management, service gilts and sows at the same time of the day. The objective of this study was to evaluate different timing of insemination of gilts and its influence on conception rate and litter size.

Materials and Methods

The experimental design was established as a 2×3 factorial design of two genetic lines of gilts and three different timings of insemination. Treatments were applied to 131 gilts of PIC line C-22 and 30 gilts of PIC line C-42. Each gilt used in the study was randomly allocated to the particular time of applied service. Table 1 presents how insemination timings were established.

Table 1. Timing of insemination.

Timing	First Service	Second Service
1	9:00 AM	6 hours later
2	9:00 AM	24 hours later
3	3:00 PM	24 hours later

Heat checking in presence of a boar occurred once a day in the morning. At this time all gilts identified as being in heat were moved from the breeding pens into individual crates. The first group of animals was inseminated immediately after heat detection, at approximately 9:00 AM and service was repeated six hours later. The second group of gilts was inseminated at 9:00 AM and a second service occurred 24 hours later. The third group of females was serviced for the first time six hours after heat detection and again 24 hours later. Two weeks after first service, gilts were exposed to a boar and intensive observation for signs of estrus was initiated to detect animals returning to heat. On days 28–35 after insemination, all gilts were checked for pregnancy using a real-time ultrasound machine and the results were used to estimate conception rate. At the end of gestation, pregnant animals were moved to farrowing crates where number of piglets born alive from each gilt was counted. The

General Linear Models procedure of SAS was used to analyze the data.

Results and Discussion

For conception rate, the best results were produced by timings two and three, shown in Table 2, with conception rates of 92 and 91%, respectively, whereas for timing number one gilts, conception rate was 86%. The higher conception rates for timing two and three suggest a need for a 24-hour interval between services. In this trial, where heat detection occurred only once a day, time of first service appeared to be insignificant. Line C-42 achieved 92% conception rate, whereas line C-22 obtained only 87%.

Table 2. Conception rate by genetic line and time of insemination.

	Time 1		Time 2		Time 3		Overall
	Mean %	SE	Mean %	SE	Mean %	SE	Mean %
C-22	87	0.1	84	0.1	90	0.1	87
C-42	86	0.1	100	0.1	92	0.1	92
Overall	86	0.1	92	0.1	91	0.1	

Although differences among means in conception rate were identified, none of the analyzed factors obtained statistical significance. Table 3 represents means and standard errors for pigs born alive by genetic line for each treatment.

Table 3. Pigs born alive by genetic line and time of insemination.

	Time 1		Time 2		Time 3		Overall
	Mean	SE	Mean	SE	Mean	SE	Mean
C-22	9.8	0.5	9.7	0.5	9.4	0.5	9.6
C-42	8.3	1.2	11.0	0.9	11.0	0.9	10.1
Overall	9.1	0.6	10.3	0.5	10.2	0.5	

Line C-42, in comparison with line C-22, appeared to be more prolific with 10.1 piglets born alive/litter versus 9.6 pigs born alive/litter for line C-22. In this case as well, however, analysis of variance did not produce any strong evidence for the difference among means (P>.45). No statistical difference between means was found for timing of insemination (P>.24). Interaction between genetic line and timing of insemination approached significance at the 0.12 level. We only suggest a trend toward this interaction because strong evidence does not exist.

Line C-22 gilts had the highest number of pigs born alive if they were inseminated immediately after heat detection and service was repeated 6 hours later. Delay of the service decreased number of pigs born in the litter linearly. Line C-42 gilts had the lowest number born alive if they were inseminated directly after heat detection and serviced again six hours later. Number born alive was improved if timing two or three was applied. Line C-42 was superior in reproductive traits when compared with line C-22. These data suggest that it might be beneficial to inseminate C-22 gilts in the morning and repeat service after six hours, whereas line C-42 gilts should be inseminated twice with a 24-hour interval. Additional information would be necessary to verify these findings.

References

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