Factors influencing age at first mating in purebred Swedish Landrace and Swedish Yorkshire gilts

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Abstract

The aim of the present study was to retrospectively analyze causes of the variation in age at first mating in Swedish Landrace (L) and Swedish Yorkshire (Y) gilts. Production traits including growth rate from birth to 100 kg body weight and backfat thickness at 100 kg body weight were also studied. Data analyzed were obtained from 11 L and 11 Y nucleus herds and included gilts born during a 5-year-period from October 1993 until September 1998. The complete data set included information on 14,761 gilts (6997 L and 7764 Y). Traits analyzed included age of gilt at first mating, growth rate and backfat thickness. Seven statistical models were used for analyzing the data. Factors included were gilt breed, birth month, parity number and size of the litter in which the gilt was born as well as their interactions. Compared with Y gilts, L gilts grew faster (571 versus 556 g/day; \( P < 0.001 \)), had a thinner backfat (11.9 versus 12.3 mm; \( P < 0.001 \)) at 100 kg body weight and were 12 days younger at first mating (237 versus 249 days; \( P < 0.001 \)). Birth month significantly (\( P < 0.001 \)) influenced age at first mating, growth rate and backfat thickness. Gilts born from smaller litters were mated at younger age than gilts born from larger litters even when age at first mating was adjusted for the effect of growth rate and backfat thickness. Growth rate of the gilts decreased when ‘birth litter size’ increased. Gilts born from primiparous sows grew slower, had a thinner backfat at 100 kg body weight and were older at first mating compared with gilts born from multiparous sows. Gilts with a higher growth rate were younger at first mating than those with a lower growth rate. Gilts with a thicker backfat at 100 kg body weight were mated earlier than the thin ones. However, the effect of growth rate on age at first mating was more pronounced in the...
gilts with a thinner backfat rather than the ones with a thicker backfat. © 2000 Elsevier Science B.V. All rights reserved.

Keywords: Pig-reproductive performance; Age at first mating; Growth rate; Backfat thickness

1. Introduction

In Sweden, Swedish Landrace (L) and Swedish Yorkshire (Y) purebred sows, born in nucleus herds are the most important base for producing crossbred gilts to supply the commercial herds. In general, the replacement rate in a herd varies between 30 and 50% each year. Reproductive problems, e.g. not in heat, not pregnant and repeat breeding are the most common reasons for culling of sows (approximately 30% of total culling; Jonsson, 1995). The proportion of gilts in a herd, and their reproductive efficiency are important for the overall herd productivity (Christenson, 1986). Previous studies have shown a significant relationship between various environmental factors and reproductive performance in L and Y sows (Tummaruk et al., 2000a,b). However, factors influencing the reproductive performance of gilts need to be further analyzed.

Before puberty, growth of gilts, including protein accretion, lipid deposition as well as energy requirement, differs between breeds and genotypes (Henken et al., 1991). Furthermore, growth rate in gilts depends on their feed intake and metabolism (reviewed by Schinckel, 1999) which are influenced by various environmental factors such as climatic conditions, rearing density, and housing system (reviewed by Black et al., 1999). Growth rate and backfat thickness of the gilts are significantly related to age at puberty (Eliasson, 1991; Eliasson et al., 1991; Rydhmer et al., 1994).

For gilts, minimum threshold values for live weight, fat mass and age must be achieved before sexual maturity occurs (Kirkwood and Aherne, 1985; Newton and Mahan, 1993). Age at puberty of gilts is defined as the time of first oestrus and ovulation with a continuation of regular oestrous cycles. On average gilts attain puberty at about 6–7 months of age. However, age at puberty of gilts is generally not registered in herds because it is difficult to make an accurate estimation. Instead, ages of gilts at first mating, age at conception as well as age at farrowing have been used in field studies (Linde et al., 1984; Schukken et al., 1994; Tummaruk et al., 2000a). These factors have also shown an association with subsequent sow reproductive performance and longevity (Schukken et al., 1994; Le Cozler et al., 1998; Koketsu et al., 1999). Age at first mating, focused on in the present study represents the gilt’s possibility to attain puberty, to show behavioral oestrus and to be mated, but includes also management decisions. Since mating of gilts at second or later observed oestrus is recommended, age at first mating in gilts is often about 6 weeks later than age at puberty.

The objective of the present study was to retrospectively analyze causes of variation in age at first mating in L and Y gilts. The analysis focused on the effect of gilt breed, birth month as well as information on the litters in which the gilt was born (birth litter size and sow parity number). Furthermore, the influences of production traits such as growth rate and backfat thickness were also examined.
2. Materials and methods

2.1. Description and location of the nucleus herds

In Sweden, most slaughter pigs are three-breed crosses and progenies of \( L \times Y \) dams. The structure of swine breeding can be visualized as a pyramid consisting of three levels: nucleus herds, multiplier herds and commercial herds (Simonsson and Rydhmer, 1996). Quality genetics (formerly Scan Avel HB) which is responsible for organizing the pig breeding work for approximately 80% of the Swedish pig industry, registers data from the nucleus herds in a herdbook from which the analyzed data were extracted. In 1998, 15 \( L \) and 15 \( Y \) nucleus herds were active within this breeding organization. The present study was based on data from 11 \( L \) and 11 \( Y \) of these nucleus herds. To be included in the present study, the herd had to be comparatively large (>80 sows) and had to have a substantial number of gilts born between 1993 and 1998. Furthermore, all the gilts included had to be born and mated for the first time within the same herds.

The nucleus herds included in this study are located in the middle and southern part of Sweden, between latitude 55° and 60° N and between longitude 10° and 20° E. The yearly variation in photoperiod in this part of Sweden is relatively high. Day length varies from about 18.6 h in June to 5.9 h in December. However, swine producers usually compensate for the variation in photoperiod by supplying artificial light for approximately 14–16 h/day in the sow units throughout the year.

2.2. General management

The gilts were weaned at about 40 days (minimum 4 weeks according to Swedish legislation). The performance testing, i.e. ultrasonically recorded backfat thickness, weight of the gilts and calculated growth rate from birth, was carried out in the weight range 85–130 kg. Gilts were usually mated in their second observed oestrus or later at about 7–9 months of age and at a body weight of about 120 kg. Both AI and natural mating were used in all herds. The number of observations obtained from each herd varied. On average, during the 5-year-period analyzed (see below), the number of gilts born per herd was 655 gilts (325–1435) for \( L \) herds and 741 gilts (343–1712) for \( Y \) herds. Records concerning feed intake and the use of boar exposure were not available and therefore not a focus of the present study. However, the gilts were fed according to the Swedish recommendation in all herds (Simonsson, 1988). The variation of traits analyzed due to herd management (both within herd and between herd) was also partly taken into account by including effect of herd-year combination within breed as a random factor for all statistical models (see below).

2.3. Data analysis

The primary data included 15,348 gilts born during a 5-year-period from October 1993 until September 1998 (mating records were available until October 1999). The records consisted of herd and gilt identities, breed of the gilt, birth date, size of the litter (both total born and born alive) in which the gilt was born (birth litter size), parity number of the litter in which the gilt was born (birth parity), date and weight of gilt at performance test, backfat
thickness, growth rate from birth until the day of the performance testing, first mating date and type of mating (natural mating or artificial insemination). Variables like age at first mating, age at performance test, growth rate and backfat thickness adjusted to 100 kg body weight were calculated from primary data (see below). Gilts younger than 150 days or older than 348 days at first mating were excluded (207 gilts; 1.3%). Incomplete records regarding any of the other variables also led to exclusion (380 gilts; 2.5%). The complete data set included 14,761 gilts (6997 L and 7764 Y).

2.4. Definitions

Age at first mating was defined as the number of days from birth to first mating. Day 0 is the day when the gilt was born.

Growth rate was defined as the average weight gain per day (g/day from birth until the time of performance testing and, in the analysis, growth rate was adjusted to 100 kg body weight using the following formula (Quality Genetics, 1998):

\[
\text{Adjusted growth rate} = \frac{\text{weight at performance test (kg)} - \text{(weight at performance test (kg) - 100) - 1.5}}{\text{(age at performance test} - \text{(weight at performance test (kg) - 100) x 0.8)}}
\]

Backfat thickness was defined as the mean of the depth of fat (mm) measured by ultrasound (A-mode) at the level of the last rib approximately 8 cm on both sides of mid line. The backfat thickness was also adjusted to 100 kg body weight using the following formula (Quality Genetics, 1998):

\[
\text{Adjusted back fat for Y} = \text{Backfat (mm) - (weight at performance test (kg) - 100) x 0.14}
\]
\[
\text{Adjusted back fat for L} = \text{Backfat (mm) - (weight at performance test (kg) - 100) x 0.12}
\]

2.5. Statistical analysis

Statistical analysis were carried out by using the SAS computer package (SAS Institute Inc., 1989). Descriptive statistics were obtained using MEANS and FREQ procedures. Analysis of variance was applied using the MIXED and GLM procedures. Traits analyzed were growth rate, backfat thickness at 100 kg body weight and age at first mating. The factors and interactions included in the statistical models (see below) were tested for significance and omitted from the model in a stepwise fashion, leaving only factors and interactions in most of the cases with a significance level of \( P < 0.1 \). Least-square means were obtained from each class of the effects and combination of effects and were compared using the \( t \)-test. To account for the effect of herd management and yearly variation in gilt reproductive performance, the observations were grouped into 12-month periods by birth month of the
gilt (i.e. October 1993–September 1994; October 1994–September 1995 etc.) and were combined with herd effect. This herd-year effect was nested within breed and regarded as a random factor in all of the mixed models. Partial correlation between growth rate and backfat thickness by gilt breed was obtained from multivariate analysis of variance (MANOVA) under GLM procedure. The statistical models in the GLM procedure included the effects of herd-year combination and birth month.

Seven statistical models under the MIXED procedure were used for analyzing the data. The first three basic models focused on seasonal effect and breed difference in age at first mating, growth rate and backfat thickness of the gilts, respectively. Effects of breed, birth month, and interaction between breed and birth month were included in all models. Models 4–6 focused on the effects of ‘birth litter size’ (total born) and ‘birth parity’ on age at first mating, growth rate and backfat thickness. These effects were included along with the factors included in models 1–3. ‘Birth litter size’ was classified into eight classes (≤8, 9, 10, 11, 12, 13, 14 and ≥15 piglets/litter). For ‘birth parity’, gilts born from sow parities ≥6 were pooled due to a comparatively low number of observations in each of these high parity groups. In model 7, regression on growth rate and backfat thickness as well as interactions were added into the model along with the factors included in model 4.

Factors included in each model, number of gilts and levels of statistical significance (F-test) are summarized in Table 2. Levels of significance are given conventionally: n.s. = no significant difference (P > 0.05); and significant difference * = 0.01 < P ≤ 0.05; ** = 0.001 < P ≤ 0.01; *** = P ≤ 0.001.

3. Results

3.1. Descriptive statistics

Descriptive statistics for both reproduction and production traits of L and Y gilts, including the number of observations, arithmetic means, standard deviations and ranges of the data, are presented in Table 1. L gilts were younger at first mating, grew faster from birth to 100 kg and had a lower backfat thickness at 100 kg body weight compared with Y gilts. For both breeds about one-third of the gilts were born from primiparous sows (29% for L and

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Swedish Landrace (n = 6997)</th>
<th>Swedish Yorkshire (n = 7764)</th>
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<tbody>
<tr>
<td></td>
<td>Mean S.D. Range</td>
<td>Mean S.D. Range</td>
</tr>
<tr>
<td>Age at first mating (days)*</td>
<td>237 25 150–348</td>
<td>247 26 153–348</td>
</tr>
<tr>
<td>Growth rate (g/day)</td>
<td>566 57 327–802</td>
<td>562 53 349–750</td>
</tr>
<tr>
<td>Backfat (mm)</td>
<td>12.1 1.9 5.6–22.2</td>
<td>12.5 2.2 6.0–25.9</td>
</tr>
<tr>
<td>Birth litter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sow parity number</td>
<td>2.9 1.9 1–13</td>
<td>2.9 2 1–14</td>
</tr>
<tr>
<td>No. of total born/litter</td>
<td>12 2.6 3–26</td>
<td>12.2 2.7 3–22</td>
</tr>
<tr>
<td>No. of born alive/litter</td>
<td>11.3 2.4 1–21</td>
<td>11.3 2.5 1–20</td>
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</table>

* Data with extreme values (<150 days or >348 days) are not included (207 gilts; 1.3%).
32% for Y) and the litter size at birth was about 12 piglets. Performance testing took place at a mean age of 174 days (~25 weeks) and at an average body weight of 97 kg (85–130). Natural mating was used more frequently at first mating than AI: about 63:37% for L gilts and 80:20% for Y gilts.

3.2. Growth rate and backfat thickness of the gilts included in the present study

Growth rate of the gilts was influenced by breed, birth month, ‘birth litter size’, ‘birth parity’ and some interaction effects (Table 2). L gilts grew significantly ($P < 0.05$) faster than Y gilts (571 versus 556 g/day, model 2). Gilts born from May to November grew significantly ($P < 0.05$) faster than gilts born from January to April (Fig. 1). Growth rate of the gilts decreased when ‘birth litter size’ increased, for example, gilts born from litters with ≤8 piglets grew significantly ($P < 0.05$) faster than gilts born from litters with nine or more piglets (Fig. 2). However, growth rate of the gilts with the ‘birth litter size’ from 11 to 13 piglets did not differ significantly from each other (Fig. 2). ‘Birth parity’ significantly ($P < 0.05$) influenced growth rate of the gilts. Gilts born from primiparous sows had a significantly ($P < 0.001$) lower growth rate than gilts born from multiparous sows (when adjusted for birth litter size, model 5) (Fig. 3).

Backfat thickness at 100 kg body weight of the gilts was influenced by breed, birth month, ‘birth parity’ and some interactions (Table 2). L gilts had on average 0.4 mm lower

**Table 2**
Structure of data analyzed (all models were based on a complete data set of 14,761 gilts, 6997 L and 7764 Y)

<table>
<thead>
<tr>
<th>Data analyzed</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
<th>Model 5</th>
<th>Model 6</th>
<th>Model 7</th>
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<tbody>
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<td>Factors</td>
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</tr>
<tr>
<td>Breed (B)</td>
<td>d</td>
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<td>d</td>
<td>d</td>
<td>d</td>
<td>d</td>
<td>d</td>
</tr>
<tr>
<td>Birth month (BM)</td>
<td>f</td>
<td>f</td>
<td>f</td>
<td>f</td>
<td>f</td>
<td>f</td>
<td>f</td>
</tr>
<tr>
<td>Birth litter size (BL)</td>
<td>n.s.</td>
<td>n.s.</td>
<td>d</td>
<td>n.s.</td>
<td>d</td>
<td>n.s.</td>
<td>d</td>
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<tr>
<td>Birth parity (BP)</td>
<td>f</td>
<td>f</td>
<td>f</td>
<td>f</td>
<td>f</td>
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<td>f</td>
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<tr>
<td>B × BM</td>
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<td>B × BP</td>
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<td>BM × BP</td>
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<td>BM × BL</td>
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</tr>
<tr>
<td>BP × BL</td>
<td>n.s.</td>
<td>n.s.</td>
<td>f</td>
<td>n.s.</td>
<td>f</td>
<td>n.s.</td>
<td>f</td>
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<tr>
<td>Growth rate (GR)</td>
<td>–</td>
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<td>–</td>
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<td>–</td>
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<tr>
<td>Backfat (BF)</td>
<td>–</td>
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<td>B × GR</td>
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<tr>
<td>BF × GR</td>
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</tbody>
</table>

$^a$ Age at first mating (day).
$^b$ Growth rate (g/day).
$^c$ Backfat thickness (mm).
$^d$ $P \leq 0.05$.
$^e$ $0.01 \leq P < 0.05$.
$^f$ $0.001 \leq P < 0.01$.
$^g$ $P > 0.05$.
$^h$ Interaction between the main effects.
Fig. 1. The influence of birth month of gilts on age at first mating and growth rate. Values with different letter on the same line differ significantly ($P < 0.05$).

Gilts born in July and August had a significantly thicker backfat ($\geq 0.2$ mm, $P < 0.05$) than gilts born from January to April and from September to November. ‘Birth parity’ also significantly ($P < 0.05$) influenced backfat thickness of the gilts (model 6). Gilts born from primiparous sows had a significantly ($P < 0.05$) lower backfat thickness than gilts born from sows parity 2, 4, 5 and $\geq 6$ sows. Gilts born from primiparous sows had about 0.2 mm thinner backfat than gilts born from parity 5 sows, which were the fattest ones ($P < 0.05$).

Analysis of partial correlation (MANOVA) revealed that growth rate was positively correlated with backfat thickness in both L ($r = 0.18; P < 0.001$) and Y ($r = 0.26; P < 0.001$) gilts.

Fig. 2. The influence of ‘birth litter size’ on age at first mating (AFM) and growth rate (GR). Values with different letter on the same line differ significantly ($P < 0.05$).
3.3. Factors influencing age at first mating

Age at first mating was influenced by breed, birth month, ‘birth litter size’, ‘birth parity’, growth rate, backfat thickness at 100 kg body weight and some interactions (Table 2).

L gilts were, on average, 12 days younger at first mating compared with Y gilts (237 versus 249 days, \( P < 0.001 \); model 1). Across breeds, gilts born from November until April were significantly \( (P < 0.05) \) older at first mating compared with gilts born in June, July, August and October (Fig. 1). However, L gilts were less influenced by birth month than Y gilts. For L gilts, only those born in January and March were significantly \( (P < 0.05) \) older at first mating compared with those born in June, July, and August. Whereas for Y gilts, those born in December and from February to April were significantly \( (P < 0.05) \) older at first mating compared with gilts born in June, July, and August.

‘Birth litter size’ significantly \( (P < 0.001) \) influenced age at first mating (model 4, Table 2). Gilts born from litters with \( \leq 8 \) piglets were significantly younger (6.4 days) at first mating compared with gilts born from the litters with nine or more piglets \( (P < 0.05; \) model 4; Fig. 2). This influence was reduced to 3.1 days when age at first mating was adjusted for the effect of growth rate and backfat (model 7; Fig. 2). However, age at first mating of gilts with the ‘birth litter size’ from 10 to 13 piglets did not differ significantly from each other (Fig. 2).

‘Birth parity’ of the gilt also had a significant \( (P < 0.001, \) model 4) influence on age at first mating (Fig. 3). Gilts born from primiparous sows were oldest at first mating (when adjusted for birth litter size) and gilts born from parity 5 sows were youngest: the difference being 5 days \( (P < 0.001) \). However, the pattern of ‘birth parity’ effect on age at first mating slightly differed between breeds as indicated by a significant interaction between breed and ‘birth parity’ \( (P < 0.05, \) Table 2).

Growth rate significantly \( (P < 0.001) \) influenced age at first mating of gilts (model 7, Table 2). For both L and Y gilts, age at first mating was reduced by approximately 0.2 days
per gram increase in growth rate. This association was more pronounced in L compared with Y gilts.

Backfat thickness at 100 kg body weight significantly \( (P < 0.001) \) influenced age at first mating (model 7, Table 2). The regression analysis revealed that age at first mating decreased by 3.7 days per mm increase in backfat at 100 kg. Furthermore, the interaction between growth rate and backfat thickness was significant \( (P < 0.001, \text{Table 2}) \). Lean gilts (low backfat thickness) with high growth rate were mated earlier but for the fat ones, the impact of growth rate was very small.

4. Discussion

Age at first mating was the focus of the present study. In all nucleus herds in Sweden, mating is performed at about 7–9 months of age or at about 120 kg liveweight. In the present study, the average age at first mating was 237 days for L and 249 days for Y gilts, which is relatively high compared with commercial crossbreed herds (Schukken et al., 1994; Koketsu et al., 1999). Age, growth rate as well as body weight are of importance for puberty attainment, and all of these parameters are generally considered together since they are closely related. Although a number of studies have shown that age is a more important factor for puberty than live weight, a great variation in both age and live weight at puberty is still observed (reviewed by Hughes, 1982). Naturally, fast-growing gilts reach pubertal weight and hence are being mated at a younger age than the slow-growing ones. In this sense, any factor influencing growth rate is also influencing age at first mating. The present study demonstrated a significant interrelationship between production traits and mating age. Factors such as breed, season of birth, ‘birth parity’ and ‘birth litter size’ were found to influence both production and reproduction traits of gilts.

The present study showed that L gilts were almost 2 weeks younger than Y gilts at first mating. This is in accordance with our previous finding that L sows were younger at first farrowing compared with Y sows (Tummaruk et al., 2000a). Furthermore, Christenson and Ford (1979) found that L gilts were younger at puberty compared with Y gilts. In the present study, breed differences were also found in production traits, i.e. L gilts grew faster and had a thinner backfat than Y gilts. This is in agreement with Bidanel et al. (1996), who showed that French Landrace gilts had a thinner backfat at 85 kg live weight and showed first standing oestrus at about 2 weeks earlier than Large White (Yorkshire) gilts. Since the heritability level for production traits like growth rate and backfat thickness is moderately high \( (h^2 = 0.3; \text{Rydhmer et al., 1995}) \), these traits are largely dependent on the genetic background of the pigs. However, the higher growth rate from birth to 100 kg in L gilts might also be due to the fact that L sows have a higher milk production compared to Y sows. In Sweden, a clinical and genetic study showed that some Y sows belonging to nucleus herds had a disturbed (reduced milk production, culminating around 3 weeks of lactation (Rydhmer et al., 2000). Additionally, since L-piglets are heavier than Y-piglets at birth (Rydhmer, 1992), the heavier one may have had a greater suckling ability.

Season, expressed as birth month, significantly \( (P < 0.001) \) influenced age at first mating of the gilts, which is in agreement with a previous study (Linde et al., 1984). In general, gilts born during winter are expected to reach puberty during summer and early autumn. It has been shown that the proportion of gilts reaching puberty before 9 months of age decreases
during summer compared to winter (Christenson, 1981). A higher incidence of gilts born in January–March were culled due to anoestrus than those born in July–September (Ehnvall et al., 1981; Linde et al., 1984). It is generally recommended that the gilts should be mated at a second or third observed oestrus. The present study showed that gilts born during the winter had on average a higher age at first mating. This could be due either to delayed age at puberty or to inferior oestrous symptoms or both in the gilts that reached puberty during summer and early autumn. The present study showed that even when age at first mating was adjusted for the effect of growth rate and backfat thickness, season still showed a strong and significant influence on age at first mating of the gilts ($P < 0.001$; model 7). The effect of photoperiod on gilt puberty attainment seems to be complex and to have more than one factor involved (Love et al., 1993). For instance, season influenced the efficiency of boar contact on puberty attainment in gilts (reviewed by Hughes et al., 1990). This suggests that season might interact with some kind of herd management factors on pubertal age in gilts.

Seasonal effect was also observed for production traits in the present study. Gilts born during the winter had a lower growth rate and lower backfat thickness. Growth rate and backfat thickness mainly depend on feed intake, health status and genetic background of the gilts. It is well-established that climatic conditions (e.g. temperature, humidity, and air speed) influence feed intake and metabolism of the pigs (reviewed by Black et al., 1999). An impact of season on voluntary feed intake of the gilts might possibly be one explanation of the seasonal effect on growth rate and backfat thickness observed in the present study.

In the present study, ‘birth litter size’ also influenced age at first mating of the gilts, which is in accordance with an earlier finding that birth litter size significantly influenced age at puberty in gilts (Lamberson et al., 1988). ‘Birth litter size’ also significantly ($P < 0.001$) influenced growth rate of the gilts. Gilts born in small litters grew faster and were mated earlier than those born in a larger litter (Fig. 2). The mechanism behind this effect has not been clarified but may involve the uterine space and sex ratio of the fraternal litters (Lamberson et al., 1988) and probably also milk production of the sows. In the present study since some cross-fostering was performed in all herds, the number of piglets born alive does not completely correspond to the number of piglets nursed in that litter. It has been shown that when litter size at birth increased, the individual weight at birth of the piglets decreased (Rydhmer, 1992; Roehe, 1999). Therefore, the effects of ‘birth litter size’ observed in the present study might represent the effects of the initial size and weight of the piglets at birth rather than the number of piglets nursed on subsequent reproductive performance.

The effect of ‘birth parity’ on age at first mating of gilts has not, to our knowledge been identified previously. Gilts born from primiparous sows had a lower growth rate, thinner backfat and were older at first mating compared with gilts born from multiparous sows. Rydhmer (1992) found that piglets born in primiparous sow litters were significantly lighter than piglets born in multiparous sow litters, both at birth and at weaning. The reason for this might be that primiparous sows, on average have a lower milk production and immunoglobulin compared with multiparous sows (Speer and Cox, 1984; Smith et al., 1992; Klobasa and Butler, 1987). Furthermore, unlike multiparous sows, the primiparous ones are still growing and divert energy into body growth rather than into milk production (Pluske et al., 1998). Therefore, there is a higher risk for primiparous sows than for multiparous ones to lose more weight during lactation which in turn may reduce their milk producing ability.
In contrast, since a genetic progress in growth rate is taking place, gilts born from young mothers should grow faster. However, ‘birth parity’ still remained significant even when age at first mating had been adjusted for growth rate and backfat thickness. This means that there are some other reasons for the effect of birth parity on age at first mating beyond the impact of birth parity on growth rate of the gilts.

In the present study, an interrelationship between production and reproduction traits was significant. We found that gilts with a thicker backfat at 100 kg body weight were younger at first mating compared with the leaner ones at least if they were fast growing. Using ultrasonic index (side-fat thickness adjusted for age and weight of the gilts), Linde et al. (1984) also demonstrated that gilts with a higher index were younger at first mating. Furthermore, it has been shown that age at puberty of the gilts was negatively correlated with backfat thickness at 90 kg body weight (Eliasson et al., 1991). It is known that in a gilt, a relative amount of body fat reserves needs to be achieved before she initiates reproductive cycles (reviewed by Kirkwood and Aherne, 1985). Backfat thickness partly represents the body fat reserves of the gilts and has been considered as an important parameter for puberty attainment in pigs. For gilts with a low backfat thickness at 100 kg body weight, those that grew faster were younger at first mating. However, for the gilts with a high backfat thickness at 100 kg body weight, growth rate had a minor impact on age at first mating.

5. Conclusions

Age at first mating of the gilts was influenced by breed, birth month, ‘birth litter size’, ‘birth parity’, growth rate and backfat thickness. The impacts of ‘birth litter size’ and ‘birth parity’ were still significant even when age at first mating was adjusted for the effect of growth rate and backfat thickness.

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