Evaluation of reproductive performance in sows of Prestice Black-Pied pig - Czech genetic resource

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ABSTRACT
The aim of the study was to evaluate reproductive performance in selected sows of Prestice Black-Pied pig included in Czech genetic resources and also to analyse losses of piglets and culling of sows according to parity order. The experimental work was conducted in a nucleus herd of sows registered in breeding book. A total of 88 sows were included in the observation. Findings indicate that productive parameters of Prestice Black-Pied sows are comparable to productive parameters of modern genotype sows. The results also showed that the highest conception rate after the first insemination was achieved after the second, the third and the fourth parity. Analysis of gestation length revealed that it was significantly influenced by the parity. Very highly significant difference (P<0.001) was found between the 1st and the 2nd parity and between the 1st and the 4th parity. Total numbers of piglets and numbers live-born, stillborn and reared piglets per litter increased significantly (P<0.001, P<0.01, P<0.05) up to the 4th parity, afterwards they continuously decreased. The number of stillborn piglets was the lowest at the 2nd parity, the highest at the 5th and the 6th parity (P<0.05). Length of interval was highly significantly different (P<0.01) between the 2nd and the 5th parity and significantly different (P<0.05) between the 4th and the 5th parity. Differences in the losses of piglets were not significant among parities. The most radical culling of sows was recorded after the 3rd and the 4th parity.

Key words: Culling, Genetic resource, Losses, Prestice Black-Pied pig, Reproductive performance.

INTRODUCTION
Prestice Black-Pied pig (PBP) is an original Czech breed, which comes from the western region of the Czech Republic. In 1992 the breed was included in the genetic resources and belongs to the National program of genetic resources, coordinated by European Regional Focal Point for Farm Animal Genetic Resources (Vrtková, 2015). At present, there are approximately 500 sows of PBP bred in the Czech Republic, of which 200 – 250 are included in the population of genetic resources (Matoušek, 2013). Recent studies have highlighted the decrease in the numbers of animal genetic resources, the necessity of their conservation and expansion (Milligan et al., 2002).

PBP is characterized by very good reproductive qualities, undemanding nutrition, high level of adaptability, resistance and low requirements for breeding environmental conditions. The animals have medium body frame, very solid (hard) constitution and stress resistance. Their color is black and white without definition of black and white body parts. Typical characteristics of the breed are drooping ears. At present time, PBP cannot compete with modern breeds and their hybrids used on factory farms, because PBP reaches higher layer of back fat and lower proportions of lean meat. PBP is suitable mainly for outdoor or organic breeding systems. High quality meat of Prestice pig with higher share of fat can be used for special meat products. Sows of Prestice pig are suitable for hybridization to produce hybrid F1 generation gilts. These breeding sows are characterized by very calm temper, milkiness and strong maternal instinct (Matoušek, 2013).

According to Rydhmer et al. (2008), fertility is defined as the ability of sows to produce certain number of piglets in a litter. The aim of breeding of sows is to produce quality piglets for rearing or sale. Milligan et al. (2002) and Todd (2006) state, besides others, parity order is an important intrinsic factor influencing reproductive performance and losses of piglets.

The aim of the study was to evaluate reproductive performance of selected sows of Prestice Black-Pied pig included in genetic resources and also to analyse losses of piglets and culling of sows according to parity order.

MATERIALS AND METHODS

Animals and housing: The experimental work was conducted in a nucleus herd of sows registered in the breeding book. A total of 88 sows were included in the...
observation. In the category of inseminated sows, the animals were stabled individually from the estrus onset, through the time of insemination up to the gravidity detection, i.e. for approximately one month. This category of sows was given dry feed mixture according to individual condition by the means of individual doser. Pregnant sows were transferred to group static pens for 15 - 20 animals. The sows were equipped with transponders for dosing of feed mixture. The pregnant sows were fed with moisturized feed mixture. They stayed in group pens till approximately 5 days before farrowing. Animals in the category of sows in the high stage of gravidity, farrowing and lactating sows were stabled in individual farrowing pens. This category was also given dry feed mixture automatically. Air exchange both in farrowing house and in the stable for inseminated and pregnant sows was automatic. Piglets were given supplementary feeds since the 3rd day after birth.

**Observation and evaluated parameters:** The experimental work was focused on evaluation of reproductive performance parameters in sows, evaluation of losses of piglets from birth to weaning and culling of sows after the 1st to the 6th parity. Parameters of reproductive performance were evaluated in 88 sows after the first parity, 54 sows after the second parity, 45 sows after the third parity, 24 sows after the fourth parity, 11 sows after the fifth parity and 10 sows after the sixth parity. For exact identification, the piglets were labeled with individual codes by the means of ear notching after birth. Boars were castrated from the 5th day after  birth. The piglets were weaned at the mean age of 24±4 days.

Performance control in gilts was in accordance with the methodology CSN 466164 on performance control. Live-weight of animals was measured by weighing using digital scales. Measuring of performance parameters was done by the means of PIGLOG 105 device. Mean daily gain from birth to the day of measuring is calculated as the ratio of weight of animals was measured by weighing using digital scales. Measuring of performance parameters was done by the means of PIGLOG 105 device. Mean daily gain from birth to the day of measuring is calculated as the ratio of weight and age of individuals. Mean backfat thickness is calculated from measured values of fat in points A and B, while points A and B are defined as follows: starting points of measurement are determined in the mid dorsal line. Point A0 is on the withers perpendicular to the projection of the elbow. Point C0 is in lumbar region perpendicular to the patella. The middle between these points represents point B0. Measuring point A is in the ¼ of the line between points B0 and C0 caudally. Measuring point B is in the ¾ of the line between points A0 and B0 + 3 cm caudally. Both measuring points are 70 mm from mid dorsal line. Measuring point A is used for measuring thickness of backfat, measuring point B is used for measuring fat and muscle. Measuring is conducted in the caudo-cranial direction. Achieved phenotypic levels of mean daily gain and backfat thickness are corrected to a uniform weight of 90 kg. Phenotypic value of percentual proportion of lean meat is corrected to a uniform weight of 100 kg, (CSN 466164, 1994).

**Statistical analysis:** The data were analyzed using software QC expert (TriloByte Statistical Software Ltd.). All data were expressed as mean±SD. One way ANOVA and the Student’s test were used to determine differences between the means. The probability value of P<0.05 was considered statistically significant (a, b, c, d, e, f, g, h, i). The value P<0.01 was considered highly statistically significant (A, B, C, D, E) and the value P<0.001 was considered very highly statistically significant (A, B, C).

**RESULTS AND DISCUSSION**

The evaluation of productive parameters showed that the gilts reached mean daily gain of 548.91±63.33 g, lean meat content was 58.45±2.72 % and backfat thickness 1.09±0.26 cm.

After inclusion of the gilts into reproduction, the first evaluated parameter was age at the time of the first insemination (275.57±54.42 days) and farrowing (391.03±55.24 days). Another evaluated parameter was conception of sows after the first insemination, according to the order of parity. The highest conception rate was recorded after the second (90.06%), the third (89.11%) and the fourth litter (87.67%). The lowest conception was after the sixth litter (82.02%), the first (85.50%) and the fifth litter (86.31%).

Estimated mean values of reproductive parameters in sows and losses of piglets from the 1st to the 6th litter are shown in Table 1. The analysis of gestation length in sows revealed that it was significantly influenced by parity. Very highly significant difference (P<0.001) was found between the 1st and the 2nd parity and between the 1st and the 4th parity. Significant difference (P<0.05) was found between the 3rd and the 4th parity. Evaluation of the total number of piglets revealed a highly significant difference (P<0.01) between the 1st and the 4th litter and between the 2nd and the 4th litter, with an increase of more than one piglet per litter. The highest number of live-born piglets was recorded in the 4th litter and was followed by a decrease. Very highly significant difference (P<0.001) was found between the 1st and the 3rd litter. The difference between the 1st and the 4th litter was highly significant (P<0.01). With higher parity, also the number of stillborn piglets increased (P<0.05). The lowest number of stillborn piglets was recorded at the 2nd parity.

The evaluation of the number of reared piglets per litter showed an increase up to the 4th litter and a decrease afterwards. This trend was statistically significant (P<0.01, P<0.05). The evaluation of losses of piglets from birth to weaning was not proved the differences among individual parities. The shortest length of interval in the evaluated population of sows was between the 1st and the 2nd litter and between the 3rd and the 4th litter. Highly significant difference (P<0.01) counting 13.36 days was proved between the 2nd and the 5th litter and significant difference (P<0.05) was found between the 4th and the 5th litter (15.79 days).
Table 1: Basic statistical characteristics of reproductive parameters in sows and losses of piglets from the 1<sup>st</sup> to the 6<sup>th</sup> parity

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parity</th>
<th>1&lt;sup&gt;st&lt;/sup&gt;</th>
<th>2&lt;sup&gt;nd&lt;/sup&gt;</th>
<th>3&lt;sup&gt;rd&lt;/sup&gt;</th>
<th>4&lt;sup&gt;th&lt;/sup&gt;</th>
<th>5&lt;sup&gt;th&lt;/sup&gt;</th>
<th>6&lt;sup&gt;th&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gestation length (days)</td>
<td></td>
<td>115.58 ± 1.40</td>
<td>114.81 ± 1.01</td>
<td>114.87 ± 2.36</td>
<td>114.50 ± 1.14</td>
<td>115.00 ± 1.55</td>
<td>115.00 ± 0.67</td>
</tr>
<tr>
<td>Total number of piglets / litter</td>
<td></td>
<td>9.09 ± 1.94</td>
<td>9.17 ± 2.13</td>
<td>9.80 ± 1.91</td>
<td>10.58 ± 1.82</td>
<td>10.36 ± 2.29</td>
<td>9.30 ± 1.95</td>
</tr>
<tr>
<td>Number of live-born piglets / litter</td>
<td></td>
<td>7.85 ± 1.94</td>
<td>8.35 ± 2.05</td>
<td>8.78 ± 1.81</td>
<td>9.33 ± 1.71</td>
<td>8.73 ± 2.24</td>
<td>7.40 ± 2.72</td>
</tr>
<tr>
<td>Number of stillborn piglets / litter</td>
<td></td>
<td>1.24 ± 1.73</td>
<td>0.81 ± 1.12</td>
<td>1.02 ± 1.14</td>
<td>1.25 ± 1.54</td>
<td>1.64 ± 1.69</td>
<td>1.90 ± 2.38</td>
</tr>
<tr>
<td>Number of reared piglets / litter</td>
<td></td>
<td>7.45 ± 1.86</td>
<td>7.87 ± 1.90</td>
<td>8.33 ± 1.60</td>
<td>8.68 ± 1.77</td>
<td>9.59 ± 1.94</td>
<td>15.86 ± 15.22</td>
</tr>
<tr>
<td>Loss of piglets / litter</td>
<td></td>
<td>0.40 ± 0.65</td>
<td>0.47 ± 0.86</td>
<td>0.44 ± 0.66</td>
<td>0.47 ± 0.86</td>
<td>0.46 ± 0.79</td>
<td>0.49 ± 0.79</td>
</tr>
<tr>
<td>Loss of piglets (% / litter)</td>
<td></td>
<td>4.69 ± 7.41</td>
<td>7.48 ± 9.14</td>
<td>8.73 ± 9.07</td>
<td>15.86 ± 15.22</td>
<td>162.09 ± 24.85</td>
<td>184.13 ± 15.70</td>
</tr>
</tbody>
</table>

The culling rate of sows was high because they were breeding sows of a nucleus herd and the criteria for further parities were higher. The most sows were culled after the 4<sup>th</sup> (54.17%), the 3<sup>rd</sup> (46.67%) and the 1<sup>st</sup> (28.64%) parity. The lowest sows were culled after the 5<sup>th</sup> (9.00%), the 6<sup>th</sup> (10.00%) and the 2<sup>nd</sup> (16.67%) parity.

The values reached in the performance test of PBP pigs are comparable to results of modern genotype sows, documented by Hadáš et al. (2014). The authors found 58.74% share of lean meat, 539 g of daily gain and 11.40 mm of back fat by a performance test in hybrid gilts. Tummaruk et al. (2000) presented mean daily gain of 566 g and back fat thickness of 12.1 mm in gilts of Swedish Landrace. They documented similar results also in gilts of Swedish Yorkshire. Later, Tummaruk et al. (2007) evaluated also hybrids of these breeds and they recorded daily gain of 530.5 g and back fat thickness of 13.0 mm. Matoušek (2013) states that gilts of Prestice pig should reach mean daily gain of 540 g, back fat thickness of 10 – 12 mm and lean meat share of 58 – 59% in test. The findings show that productive parameters of Prestice Black-Pied gilts correspond to productive parameters found in sows of current genotypes.

The first evaluated reproductive parameter was age at the time of the first insemination and farrowing. In current genotypes of sows, lower age of the first insemination than in regional breeds is recorded, which was documented in publications by Kummer et al. (2006), who inseminated gilts at mean age of 222.8 days in their experiments, on the other hand Egerszegi et al. (2003) stated that the best age for the first insemination in Mangalica breed was 11 months.

The results of conception of sows after the first insemination indicate that conception rates after individual parities are relatively equal. Roca et al. (2003) recorded conception rate of 78.79% in sows in a production herd. Xue et al. (1998), who evaluated reproductive capabilities of gilts found conception rate of 93.40% in gilts after the first insemination and 93.7% in sows.

The evaluation of reproductive performance in PBP sows proved significant differences between individual parities and lower overall reproductive performance when compared to modern genotype sows. Matoušek (2013) reported that the sows of PBP should reach 11 live-born piglets and 9.6 reared piglets per litter. Horák et al. (2005) found 11.84 piglets in total, 10.88 live-born and 9.44 reared piglets per litter in PBP sows. It is evident from the achieved results, that the reproductive performance increased up to the 4th parity, which corresponds to the results described by Whittemore (2006), who state that fertility grows up to the 4th litter and then continuously drops. Kummer et al. (2006) evaluated the effect of parity on the number of born piglets, too. In the first litter, they recorded 11.8 piglets in total and 10.5 live-born piglet, in the second litter 10.6 piglets in total and 10.1 live-born piglets and in...
the third litter 12.4 piglets in total and 11.5 live-born piglets. The mean share of stillborn piglets in all litters was 10.21%. Fix et al. (2010) emphasize the importance of parity order. At later parities, they observed increased losses of piglets (P<0.01). Matoušek (2013) considers 165 days an optimal length of interval in PBP sows. Horák et al. (2005) documented interval length between 165.58 – 172.27 in their study.

The last observed parameter was culling of sows after individual parities. The experiment of Holendová and Čechová (2010) revealed that exclusion of sows was radical at the beginning, but with following parities it slowed down. Boyle et al. (1997) assumed that 40 – 50 % of sows are excluded before the third or fourth litter. Mote et al. (2009) add that only 67.5 % of sows reach the third parity.

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