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EFFECT OF FARM ON PRODUCTIVE AND REPRODUCTIVE PERFORMANCE IN SOWS OF PRESTICE BLACK-PIED PIG

Pavel Nevrkla[1], Eva Václavková[2], Zdeněk Hadaš[1], Pavel Horký[3]

[1] Department of Animal Breeding, Faculty of AgriSciences, Mendel University in Brno, Zemědělská 1, 613 00 Brno, Czech Republic

[2] Department of Pig Breeding, Institute of Animal Science, Kostelec nad Orlicí, Komenského 1239, 517 41 Czech Republic

[3] 3Department of Animal Nutrition and Forage Production, Faculty of AgriSciences, Mendel University in Brno, Zemědělská 1, 613 00 Brno, Czech Republic

Abstract

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The aim of the study was to evaluate productive and reproductive performance of Prestice Black-Pied sows including losses of piglets from birth to weaning in conditions of two farms. The experiment involved one hundred sows of Prestice Black-Pied pig from the 1st to the 7th parity (50 from farm A and 50 from farm B). The evaluation of productive parameters revealed a highly statistically significant difference ($P \leq 0.001$) between gilts of the observed farms in percentage of lean meat. Backfat thickness was 0.19 cm lower in gilts from the farm A, which is a very highly statistically significant difference ($P \leq 0.001$). The evaluation of reproductive performance showed, that age at the time of the first insemination and farrowing was significantly higher ($P \leq 0.05$) in gilts from the farm A compared to gilts from the farm B by 38 days on average. The analysis also indicates that there was no significant difference in length of gestation, total number of piglets and numbers of live-born and reared piglets between the sows of the evaluated farms. A highly statistically significant difference ($P \leq 0.01$) was found in number of stillborn piglets. Interval length was significantly longer ($P \leq 0.05$) in sows from the farm A, by 14.29 days. The evaluation of losses of piglets revealed a significant difference ($P \leq 0.05$) between the farms in favor of piglets from the farm A.

Keywords: Prestice Black-Pied, farm, sow, piglet, performance

INTRODUCTION

Chapinal *et al.* (2010) and Mlynek *et al.* (2013) refer to management, housing and feeding technology, mating method and the level of basic herd renewal as the effect of farm. Merks *et al.* (2000) note that the level of farm management can limit the genetic potential of reproductive performance in sows. This is confirmed by Spoolder *et al.* (2009), who state that the overall fertility is influenced by a range of factors, determined by genetics and environmental conditions on the one side, but on the other side it is most frequently expertise – qualification and practical abilities of workers on individual farms, who are responsible for this farming segment. According to the authors, there are often mistakes in the standing reflex determination in a part of inseminated sows on many farms, which increases the percentage of non-pregnant sows and mainly the reduced fertility of sows, which were inseminated too early or too soon. The results of conception and fertility are also largely influenced by the process of insemination. When classical insemination method is used, very often a part of semen dose, sometimes even its majority, is discharged. The importance of management is also emphasized by Chapinal *et al.* (2010), who state that an irreplaceable role in pig breeding is still covered by professionality and effort of keepers as a part of management, which largely affects performance in all stages of reproductive cycle.

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 (Dostálová *et al.*, 2012; Vrtková, 2015). 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 (Mlynek *et al.*, 2012; Matoušek, 2013; Falková *et al.*, 2014).

The aim of the study was to evaluate productive and reproductive performance in Prestice Black-Pied sows, including losses of piglets from birth to weaning in conditions of two farms.

MATERIALS AND METHODS

The experiment involved 100 Prestice Black-Pied sows from the 1st to the 7th litter (50 from farm A and 50 from farm B). Sows selected for the observation from both farms had the same distribution of parities. The first parity was represented by 14 sows, 11 sows were at their second parity, 8 sows at the third parity, 6 at the fourth parity, 5 at the fifth parity, 4 at the sixth parity and 2 at the seventh parity. Both observed farms had breeding farm status.

Farm A: Sows were stabled in individual farrowing pens in farrowing house. Feed was administered manually. Air ventilation was solved with ventilation flaps. The floor in stable for inseminated and pregnant sows was solid and the sows were stabled in groups of 6-10 animals. Feed administration was manual according to condition of sows. Ventilation was solved with ventilation flaps. Three employees alternated in the stable.

Farm B: The sows in farrowing house were stabled in farrowing cages. Feed administration and air ventilation was solved automatically. The floor in the stable for inseminated and pregnant sows was partially slatted and the animals were stabled in groups of 10-12. Feed andministration and ventilation was automatic also in the stable for inseminated and pregnant sows. Two employees alternated in the stable.

The experimental work was focused on evaluation of productive and reproductive performance parameters in sows, evaluation of losses of piglets from birth to weaning. 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 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 A_0 is on the withers perpendicular to the projection of the elbow. Point C_0 is in lumbar region perpendicular to the patella. The middle between these points represents point B_0. Measuring point A is in the ¾ of the line between points B_0 and C_0 caudally. Measuring point B is in the ¾ of the line between points A_0 and B_0 + 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.

The data were analysed using software QC expert (TriloByte Statistical Software Ltd.). All data were expressed as namely mean,standard deviation, coefficient of variation, maximum and minimum values and statistical significance based on the t-test. 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 (*). The value $P < 0.01$ was considered highly statistically significant (**) and the value $P < 0.001$ was considered very highly statistically significant (***).

RESULTS AND DISCUSSION

Table I presents productive parameters of gilts in the performance test according to farm. The results show that difference in mean daily gain between the evaluated farms was not significant. On the contrary, in the percentage of lean meat, the difference between gilts of the observed farms was very highly significant ($P \leq 0.001$). In gilts from the farm A, the lean meat content was higher by 2.13 % than in gilts from the farm B. The backfat thickness was 0.19 cm lower in gilts from the farm A, which represents a very highly significant difference ($P \leq 0.001$).

The values are comparable with results of modern genotype sows, documented by Hadaš *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

I: *Basic statistical characteristics of productive parameters in gilts in the performance test by the farm*

Parameter	Farm	Mean	S_x	V_x	Min	Max	Significance
Average daily gain (g/day)	A	535.54	55.59	10.38	415.00	654.00	NS
	B	558.66	69.90	12.51	402.00	751.00	
Lean meat content (%)	A	60.20	1.74	2.89	56.80	64.00	***
	B	58.07	2.76	4.76	50.90	63.20	
Backfat thickness (cm)	A	0.96	0.16	16.90	0.57	1.22	***
	B	1.15	0.26	23.01	0.74	1.84	

NS P ≥ 0.05; *** (P ≤ 0.001)

II: *Basic statistical characteristics of the age at the time of the first insemination and farrowing by the farm*

Parameter	Farm	Mean	S_x	V_x	Min	Max	Significance
Age at 1st mating	A	306.74	56.67	18.50	242.00	435.00	*
	B	266.94	44.96	16.81	216.00	358.00	
Age at 1st farrowing	A	420.31	59.44	14.14	346.00	552.00	*
	B	382.94	45.65	11.92	328.00	475.00	

* (P ≤ 0.05)

III: *Basic statistical characteristics of reproductive parameters in sows by the farm*

Parameter	Farm	Mean	S_x	V_x	Min	Max	Significance
Gestation length (days)	A	115.26	1.71	1.49	111.00	118.00	NS
	B	115.14	0.95	0.82	113.00	117.00	
Total number of piglets/ litter	A	9.20	2.35	23.65	4.00	14.00	NS
	B	9.52	2.17	22.78	3.00	14.00	
Number of live-born piglets/ litter	A	8.16	2.38	29.23	3.00	12.00	NS
	B	8.70	2.14	24.60	3.00	13.00	
Number of stillborn piglets/ litter	A	1.76	2.02	114.54	0.00	7.00	**
	B	0.82	0.87	106.51	0.00	3.00	
Number of stillborn piglets (%/ litter)	A	16.89	18.21	107.81	0.00	66.67	**
	B	8.47	9.04	106.68	0.00	30.00	
Number of reared piglets/ litter	A	7.90	2.40	30.39	3.00	12.00	NS
	B	8.14	1.91	23.42	3.00	12.00	
Farrowing interval (days)	A	172.53	23.74	13.76	151.00	241.00	*
	B	158.24	21.55	13.59	145.00	245.00	

NS P ≥ 0.05; * (P ≤ 0.05); ** (P ≤ 0.01)

IV: *Basic statistical characteristics of losses of piglets by the farm*

Parameter	Farm	Mean	S_x	V_x	Min	Max	Significance
Loss of piglets/ litter	A	0.26	0.60	230.64	0.00	3.00	*
	B	0.56	0.73	130.88	0.00	2.00	
Loss of piglets (% / litter)	A	3.18	7.32	230.14	0.00	33.33	NS
	B	5.76	7.58	131.52	0.00	25.00	

NS P ≥ 0.05; * (P ≤ 0.05)

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.

Mean values of the age at the time of the first insemination and farrowing are shown in Table II. The age at the time of the first insemination and farrowing was statistically significantly higher ($P \leq 0.05$) in gilts from the farm A against gilts from the farm B, by 38 days on average.

Huang and Lee (1995) recommend 8 months as an appropriate age for conception and they found lower performance at the 1st and the 2nd parity in case of an early insemination. In modern genotypes of sows, lower age of the first insemination than in regional breeds is recorded, which is 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) state that the best age for the first insemination in Mangalica breed was 11 months. According to Love *et al.* (1993), the age at the first farrowing has a decisive influence on the number of piglets in the first litter. Le Cozler *et al.* (1998) assume that higher age at the time of the first litter is associated with higher number of piglets in the litter and the autors recommend the first farrowing of gilts at the age of approximately 356 days. Similar conclusions were published by Babot *et al.* (2003), who documented that higher age at the time of the first farrowing significantly influences the number of live-born piglets.

Achieved mean values of reproductive parameters in sows according to farm are shown in Table III. The performed analysis revealed that there was no significant difference between the sows of the evaluated farms in gestation length, total number of born piglets and the numbers of live-born and reared piglets. A highly statistically significant difference ($P \leq 0.01$) was recorded in the number of stillborn piglets. The difference counted 0.94 stillborn piglet more on the farm A than on the farm B. The interval length was significantly longer ($P \leq 0.05$) in sows from the farm A by 14.29 days.

Kernerová *et al.* (2012) consider the gestation length a constant period lasting 114.5 days on average (109–120). Rydhmer *et al.* (2008) found out that gestation length was influenced by genotype of 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 (1996), who state that fertility grows up to the 4th litter and then continuously drops. Chapinal *et al.* (2010) evaluated the influence of farm on reproductive performance in sows and found out that farm management can affect total numbers of piglets and numbers of live-born piglets by up to 2 piglets per litter and the number of reared piglets can differ between individual farms by 1 piglet.

In his publication, 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. In modern genotypes of sows, optimal length of interval is 162 days (Kernerová *et al.*, 2012).

Table IV presents losses of piglets from birth to weaning according to farm. A significant difference ($P \leq 0.05$) was found in favor of piglets from the farm A. The difference counted 0.3 piglet. This was confirmed by Nevrkla *et al.* (2014), who observed 2.01 piglets lost before weaning, while the number of live-born piglets was 13.21. Spoolder *et al.* (2009) note that losses of piglets are influenced by many factors, the most important ones include gene pool of sows and farm management effect. In Landrace x Large White sows, higher losses of piglets were documented at individual parities than in PBP sows (Koketsu, 2005).

CONCLUSION

The evaluation of productive parameters in gilts show that the difference in the percentage of lean meat is very highly significant ($P \leq 0.001$) beween gilts from the observed farms. The backfat thickness was 0.19 cm lower in gilts from the farm A, which is a very highly significant difference ($P \leq 0.001$). The analysis of reproductive performance revealed that the age at the time of the first insemination and farrowing was statistically significantly higher ($P \leq 0.05$) in gilts from the farm A compared to gilts from the farm B by 38 days on average. The performed analysis also shows that there was no significant difference between sows from the observed farms in the gestation length, the total number of piglets and the numbers of live-born and reared piglets. A highly statistically significant difference ($P \leq 0.01$) was found in the number of stillborn piglets. The length of interval was significantly longer ($P \leq 0.05$) in sows from the farm A by 14.29 days. In the losses of piglets, a significant difference ($P \leq 0.05$) was recorded between the farms in favor of the farm A. In conclusion, there are significant differences between the farms in the performance of Prestice Black-Pied sows.

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Contact information

Pavel Nevrkla: pavel.nevrkla.uchhz@mendelu.cz
Eva Václavková: vaclavkova.eva@vuzv.cz
Zdeněk Hadaš: zdenek.hadas@mendelu.cz
Pavel Horký: pavel.horky@mendelu.cz