

Effects of performance test of Polish Large White and Polish Landrace gilts in relation to their subsequent reproductive performance

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Abstract: *Effects of performance test of Polish Large White and Polish Landrace gilts in relation to their subsequent reproductive performance.*

The analysis covered performance test results and reproductive performance of 198 Polish Large White (PLW) sows and 96 Polish Landrace (PL) sows from a pedigree-breeding farm of the region of Pomerania and Kujawy. 1,188 litters produced from the PLW sows and 576 litters produced from the PL sows were tested (six consecutive litters). Reproductive performance of the PLW and PL sows in the subsequent six litters taken as a life reproductive efficiency demonstrated higher indicators of reproductive traits than national data. The PLW sows were characterized by the highest number of piglets at first and 21st day in the third and fifth litter ($P \leq 0.01$) and a ca seven-day lower farrowing interval (second and third litter) in comparison with the PL sows. The analysis demonstrated a negative correlation between the age of the first farrowing and the standardized daily gains ($P \leq 0.01$) in the PLW sows and a positive correlation with the body lean percentage ($P \leq 0.05$), as well as a lower number of young boars in the litters of those sows which were characterized by a higher meat content ($P \leq 0.01$) and a higher selection index value ($P \leq 0.05$). When it comes to the PL sows, the age of the first farrowing was positively correlated with the standardized backfat thickness ($P \leq 0.01$).

Key words: pigs, sows, performance test, reproductive performance

INTRODUCTION

Intensive genetic progress of pigs aims at improving their fattening and slaughtering performance, which is certain to affect the profitability of pork production. In the opinion of some researchers (Gaughan et al. 1997, Hool and Robison 2003), in gilts intended for breeding, there is a lack of balance when it comes to simultaneous reaching of a high slaughter value and a high reproductive ability. Presumably, this is the effect of different influence of various hormone groups (somatic and reproductive) on cell metabolism during growth and development of animals (Booth et al. 1994, Klindt et al. 1999). Therefore, it seems to be a well-grounded opinion on lower reproductive performance traits of sows from herds characterized by a high slaughter value. The most frequent problems observed in the reproduction of gilts and sows with a high meat content include: a less intense and shorter estrus cycle, a lower litter size and a lower number of piglets reared, delayed estrus cycle after

weaning, as well as an increased culling (Flisar et al. 2012).

It seems that among the tested traits of gilts' breeding value (so-called performance test), the gain rate, backfat thickness and carcass meat content are very important in forecasting their reproductive performance (Rekiel and Więcek 2002, Matysiak et al. 2010a, 2010b, Flisar et al. 2012).

Therefore, it seems purposeful to carry out an analysis and assessment of relationships between the results of performance test and the reproductive performance of sows of the maternal breeds PLW and PL.

MATERIAL AND METHODS

The analysis covered performance test results and reproductive performance of 198 Polish Large White (PLW) sows and 96 Polish Landrace (PL) sows from a pedigree-breeding farm of the region of Pomerania and Kujawy. The animals were maintained in accordance with animal welfare requirements and fed in compliance with recommended standards (Grela and Skomial 2014). 1188 litters from the PLW sows and 576 litters from the PL sows were tested (six consecutive litters). All the litters were born and reared between 2009 and 2014.

The test results obtained were statistically processed. An arithmetic mean and standard deviation were calculated. In order to compare the reproductive performances of the PLW and PL sows in consecutive six litters, a two-way analysis of variance and interaction was car-

ried out. For groups created as a result of dividing the study material according to factors included in the model of the variance analysis, a least significant difference test (LSD) was conducted for pairs of means for items.

Pearson correlation coefficients between the traits of performance test and reproduction were calculated within the PLW and PL sows populations. For statistical calculations, the Statistica software (StatSoft ver. 8) was used.

RESULTS AND DISCUSSION

The characteristics of the tested group of sows along with their performance test results are presented in Table 1. No statistically significant differences between the PLW and PL breeds of the tested gilts were demonstrated when it comes to the tested indicators. The values of the standardized daily gains, thickness of fat cover and carcass lean percentage corresponded to national mean data (Eckert et al. 2015). The selection index value was slightly higher (118 points for the PLW sows and 119 points for the PL sows) than the one obtained previously in own studies (Bocian et al. 2010) and the values provided by other authors (Eckert et al. 2015). Number of teats in both groups of sows were even and amounted to 14 on average. In the opinion of Rekiel et al. (2013), the higher is the number of teats in the PL sows, the higher litter size and the less losses as they are reared. This paper does not confirm this relationship. The age of the first farrowing in sows of both breeds were equal and amounted to 357 days.

TABLE 1. Results of Polish Large White (PLW) and Polish Landrace (PL) gilts' life performance (mean and standard deviation)

Trait	Breed	
	PLW	PL
Body weight of gilts (kg)	82.50 ±7.52	83.59 ±7.46
Standardized daily gains (g)	659 ±69	670 ±60
Standardized backfat thickness (mm)	10.75 ±2.11	10.95 ±2.21
Body lean percentage (%)	59.01 ±2.72	58.87 ±2.30
Selection index value (pts)	117.84 ±11.16	119.11 ±7.79
Number of teats (n)	14.37 ±0.63	14.29 ±0.60
Age at first farrowing (days)	357.3 ±33.03	357.16 ±31.77

Table 2 contains a detailed characteristics of the reproductive value of the tested sows. In two-way variance analysis the significant interaction between consecutive litters and breed of sows was not indicated. The analysed reproductive period of sows covered the first six litters and was suitable for the assessment of the life reproductive efficiency of the sows (Serenius et al. 2008, Schwarz et al. 2009). The number of piglets from the PLW sows at first and 21st day of life was the highest in the third and the fifth litter ($P \leq 0.01$); however, when it comes to litters from the PL sows, there was no significant differences. The results of reproductive performance of the tested PLW and PL sows related to the number of piglets born (NPB) and the number of piglets reared at 21st day (NPR) were clearly higher than the national data obtained for 2014 (Mucha 2015). Subsequent more, piglet mortality until the 21st day was lower than shown in the national data.

In the present study, both PLW and PL sows gave birth to 10% more gilts than young boars (56% of gilts and 44% of young boars) in each of the six consecu-

tive litters and in total (Table 2). The fact that gilts outnumbered young boars in a litter may indicate less favourable conditions for prenatal development of male embryos which show a greater susceptibility to embryonic death when there is a high density of embryos or too low intrauterine space of the sows' reproductive system (Vallet 2000, Foxcroft et al. 2009, Rekiel et al. 2013).

The study demonstrated a significantly shorter farrowing interval in the PLW sows in comparison with the PL sows, especially in the first two reproductive cycles ($P \leq 0.01$). The length of a farrowing interval is determined by the point in time when the estrus cycle occurs after weaning, the efficiency of insemination indirectly related to the intensity and length of the estrus cycle, the length of pregnancy, and other factors (Eliasson et al. 1991, Sterning et al. 1998).

Table 3 presents a correlation between the performance test and reproductive value of the PLW and PL sows.

Significant relationships only regarded the number of young boars in a litter and the age of the first farrowing. A lower number of young boars in

TABLE 2. The results of sows' reproductive performance in subsequent litters (mean and standard deviation)

Trait	Breed	Subsequent litters						Mean
		I	II	III	IV	V	VI	
Number of alive piglets born (n)	PLW	12.17 ^{A,B} ±1.40	12.58 ^a ±1.69	12.75 ^A ±1.69	12.61 ^b ±1.89	12.72 ^b ±1.78	12.44±1.91	12.54±1.74
	PL	12.33±1.24	12.51±1.53	12.72±1.70	12.59±1.84	12.53±1.86	12.32±1.87	12.50±1.69
Number of piglets reared until 21 st day (n)	PLW	11.73 ^A ±1.28	11.99±1.48	12.15 ^A ±1.65	11.96±1.72	12.07 ^a ±1.48	11.80 ^b ±1.60	11.95±1.55
	PL	11.86±1.14	11.87±1.32	12.01±1.49	11.87±1.65	11.91±1.44	11.74±1.80	11.88±1.48
Mortality piglets of from 1 st to 21 st day (%)	PLW	3.61	4.69	4.70	5.15	5.11	5.14	4.70
	PL	3.81	5.11	5.58	5.72	4.95	4.71	4.96
Number of gilts at 21 st day (%)	PLW	56.86	54.30	55.97	56.35	55.34	55.68	55.73
	PL	55.56	53.75	55.62	54.93	57.09	56.90	55.64
Number of boars at 21 st day (%)	PLW	43.14	45.70	44.03	43.65	44.66	44.32	44.27
	PL	44.44	46.25	44.38	45.07	42.91	43.10	44.36
Farrowing interval (days)	PLW	–	167.76 ^X ±23.73	164.12 ^X ±17.25	163.93±18.99	164.32±18.45	166.31±20.20	165.28 ^X ±9.36
	PL	–	175.71 ^{A,X} ±26.37	171.21 ^{A,X} ±23.12	164.20 ^{A,B} ±19.57	166.78 ^{A,C} ±22.00	164.95 ^{A,D} ±22.97	168.57 ^X ±10.81

I, II, III, IV, V, VI – subsequent litters.

^{a,a} and ^{b,b} – in line the means marked with the same small letters differ statistically significantly at $P \leq 0.05$.

^{A,A} and ^{B,B} – in line the means marked with the same capital letters differ statistically significantly at $P \leq 0.01$.

^{X,X} – values in the columns with the same capital letters differ significantly at $P \leq 0.01$.

TABLE 3. Coefficients of correlation between live performance and reproductive performance traits of PLW and PL sows

Reproductive performance	Life performance test				
	breed	standardized daily gains	standardized backfat thickness	body lean percentage	selection index value
Number of piglets born	PLW	0.010	0.127	-0.115	-0.077
	PL	0.053	-0.045	0.027	0.089
Number of piglets reared until 21 st day	PLW	-0.020	-0.056	0.044	0.014
	PL	-0.099	-0.069	0.009	-0.111
Number of gilts at 21 st days	PLW	-0.020	-0.089	0.091	0.050
	PL	-0.111	-0.066	0.029	-0.107
Number of boars at 21 st days	PLW	0.001	0.180**	-0.254**	-0.191**
	PL	0.104	-0.029	-0.166	-0.027
Age at first farrowing	PLW	-0.221**	-0.036	0.148*	-0.100
	PL	-0.044	0.278**	-0.050	-0.060

* coefficients of correlation significant at $P \leq 0.05$.

** coefficients of correlation significant at $P \leq 0.01$.

a litter was reared by those PLW sows which were characterized by thinner backfat, higher meat content and a higher selection index value ($P \leq 0.01$). The age of the first farrowing of the PLW gilts was negatively correlated with the standardized daily gains ($P \leq 0.01$) and positively correlated with the meat content of the gilts ($P \leq 0.05$). In the PL sows, on the other hand, all the correlated relationships between the traits of performance test and reproductive performance were insignificant, except for the standardized backfat thickness ($P \leq 0.01$).

CONCLUSIONS

This paper demonstrated a relatively high level of the breeding value of the tested gilts and their subsequent productivity. No noticeable differences were observed between the results of both breeds. Relationships between the performance test of the sows and their reproductive effi-

ciency turned out to be quite low – not statistically significant in most cases. A lower number of young boars in a litter occurred in those PLW sows which were characterized by thinner backfat, higher meat content and a higher selection index value as determined by the performance test.

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Streszczenie: Wyniki oceny przyżyciowej loszek rasy wielkiej białej polskiej i polskiej białej zwiślouchej a efekty ich późniejszego użytkowania rozrodczego. Analizie poddano wyniki oceny przyżyciowej i użyteczności rozplodowej 198 loch rasy wielkiej białej polskiej (PLW) i 96 loch polskiej białej zwiślouchej (PL) użytkowanych w gospodarstwie hodowli zarodowej regionu Pomorza i Kujaw. Oceniono 1188 miotów pozyskanych od loch rasy PLW i 576 miotów od loch PL (sześć kolejnych miotów). Ocena użyteczności rozplodowej loch PLW i PL w kolejnych sześciu miotach przyjęta za życiową wydajność rozrodczą loch wykazała większe wartości wskaźników cech rozplodowych od danych krajowych. Lochy PLW cechowały się największą liczbą prosiąt w pierwszym i 21. dniu w trzecim i piątym miocie ($P \leq 0,01$), a także krótszym o ok. 7 dni okresem międzymiotu (drugi i trzeci miot) w porównaniu do loch PL. Wykazano u loch PLW ujemną ko-

relację między wiekiem pierwszego oproszenia a standaryzowanymi przyrostami dobowymi ($P \leq 0,01$) oraz dodatnią z procentową zawartością mięsa w ciele ($P \leq 0,05$), a także mniejszą liczbę knurków w miotach loch o większej mięsności ($P \leq 0,01$) i większej wartości indeksu selekcyjnego ($P \leq 0,05$). U loch PL wiek pierwszego oproszenia był natomiast dodatnio skorelowany ze standaryzowaną grubością słoniny ($P \leq 0,01$).

Słowa kluczowe: świnie, lochy, ocena przyżyciowa, użytkowość rozplodowa

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