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THE EFFECT OF GENOTYPE AND PARITY ON SOME REPRODUCTIVE CHARACTERISTICS OF SOWS

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Abstract: This paper aimed to determine the effect of genotype (Large White and F1) and parity (the first five parities) on selected reproductive traits of sows. Based on the obtained results, it can be concluded there was no significant difference in the number of live-born and weaned piglets between Large White and F1 sows ($p \geq 0.05$). At the same time, parity significantly affected the number of live-born and weaned piglets ($p \leq 0.05$). Genotype did not affect piglet birth weight ($p \geq 0.05$) but significantly affected weight at weaning ($p \leq 0.05$). On the other hand, the effect of parity on birth weight and weight at weaning was significant ($p \leq 0.05$). A significant genotype x parity interaction was recorded for a number of weaned piglets and weight at weaning ($p \leq 0.05$).

Keywords: Large White, F1, sows, reproductive traits.

Introduction

Producing as many piglets per sow annually as possible is the primary goal of pig production. The health of the animals, management (including the degree of knowledge and skills in production management), compatibility of capacities, genetic composition, reproductive success, conditions of keeping the animals, available equipment, and nutrition of all categories through optimal food quality are all factors that affect productivity in pig farming (Kotlaja, 2024).

Farms achieve results based on reproductive efficiency and genetic improvement of desirable productive and reproductive traits of animals (Nojkić, 2021). The size of the sow litter is usually considered the most important fertility trait, and they can be described as the number of live-born piglets. However, the number of weaned piglets is even more commercially important than the size of the litter at birth (Stojiljković et al., 2021). Over the

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last three decades of the 20th century, the number of piglets reared per sow per year increased on well-managed farms from 16 to 22, currently standing at 28-30 (Amroziak and Rekiel, 2017). This increase led to a decrease in piglet birth weight (Quiniou et al., 2002), and piglets with a low body weight at birth have a negative effect on the efficiency of pig farming. These piglets have lower organ development and lower productivity later (Kremez et al., 2023). For every 0.1 kg decrease in the birth weight of piglets, pre-weaning mortality increased by 3%, post-weaning mortality increased by 2%, and market weight decreased by 1.63 kg (Chernetskyi, 2022). This also affects the body weight at weaning, and one of the most important goals in rearing piglets is to reach the desired target weight at weaning because only such piglets can later achieve good results in fattening (Kotlaja, 2024).

From all the above, the aim of this paper was to determine the effect of genotype and parity on selected reproductive traits: number of live-born piglets, number of weaned piglets, weight of piglets at birth and weight of piglets at weaning.

Materials and methods

The research was conducted on the farm EDUFARM DOO, Crvenka. Fifty randomly selected Large White sows and fifty F1 sows (Large White x Danish Landrace) in their first five parities were used as experimental material. The following parameters were observed: number of live-born piglets, number of weaned piglets, weight of piglets at birth and weight of piglets at weaning. The "AgroVision" program, which focuses on managing pig farms, is the source of all parameters. Data entry is adapted to the technology of the farm itself, so they are entered in the order in which they occur on the farm.

All data were analyzed by ANOVA and LSD test (Stat Soft Inc Statistica For Windows. Version 7.0., 2006).

Results and discussion

From the data in table 1, there was no significant difference in the number of live-born piglets between Large White and F1 sows ($p \geq 0.05$). The absence of a significant effect of genotype on this trait is in accordance with the results published by Kosovac et al. (2005), who did not find a significant difference in the number of live-born piglets between Swedish Landrace and the Large White x Swedish Landrace hybrid, as well as Nevrkla et al. (2017) between two unnamed tested genotypes. Contrary to this, some authors found a significant effect of genotype on this trait, usually the superiority of F1 compared to purebred sows (Luković et al., 2007; Lukač et al., 2014; Stojiljković et al., 2021).

Table 1. The effect of the examined factors on the number of live-born and weaned piglets in the litter

		Live-born piglets		Weaned piglets	
		$\bar{x}$	Sd	$\bar{x}$	Sd
Genotype					
Large White		17.70	4.22	14.46	5.76
F1		18.04	4.11	15.28	5.99
Parity					
I		17.09 b	3.92	14.60 ab	5.81
II		17.59 b	4.57	15.86 a	6.17
III		18.89 a	4.57	15.39 ab	6.16
IV		18.09 ab	3.69	14.58 ab	5.71
V		17.69 b	3.86	13.91 b	5.47
Genotype × Parity					
Large White	I	16.74 d	4.07	15.74 ab	6.33
	II	17.90 abcd	4.91	15.16 abc	6.01
	III	19.18 a	3.93	14.14 bc	6.10
	IV	17.76 abcd	3.98	14.02 bc	5.29
	V	16.94 cd	3.81	13.22 c	4.82
F1	I	17.44 bcd	3.76	13.46 bc	5.04
	II	17.28 bcd	4.22	16.56 a	6.31
	III	18.60 ab	5.15	16.64 a	6.02
	IV	18.42 abc	3.39	15.14 abc	6.09
	V	18.44 abc	3.79	14.60 abc	6.02
ANOVA					
Genotype		ns		ns	
Parity		*		*	
Genotype × Parity		ns		*	

a-d Values within the column with no common superscript are significantly different ($p \leq 0.05$)

*$p \leq 0.05$, ns - not significant.

On the other hand, parity had a significant effect on the number of live-born piglets, so with an increase in parity, the number of live-born piglets also increased. This parameter had its lowest values in the first parity and reached its maximum in the third (from the point at which the decrease started), which was not significant ($p \geq 0.05$) in the fourth parity but was ($p \leq 0.05$) in the fifth. The results support the claim that the first parity is often low and the third maximal, as reported by Nojkić (2021), who found that the first parity had 16.07 live-born piglets and the third parity had 18.52, before declining until the seventh. Similar results are reported by Radojković (2007), Kramarenko et al. (2020), Stojiljković et al. (2021) and Radović et al. (2023).

The number of weaned piglets is probably the most significant aspect of pig fertility, as the values of this parameter provide the greatest insight into the result of the technological stage of pig reproduction (table 1). It should be noticed that litter equalization and piglet transfer from one sow to another are frequently done on the farm in order to fully utilize the reproductive potential of sows. For this reason, some sows will suckle more piglets than were farrowed.

From the data in table 1, it can be seen that F1 sows weaned a slightly higher number of piglets compared to purebred sows, but this difference was not statistically confirmed ($p \geq 0.05$), which is in agreement with the results published by Nevrkla et al. (2017) and Zhukorskyi et al. (2023).

On the other hand, sows in the second parity weaned the most piglets, whereas those in the fifth parity weaned the lowest ($p \leq 0.05$). The remaining parties did not differ from these two or one another ($p \geq 0.05$), and their values were in the middle. Nojkić (2021) also found that parity had significant effect on this trait, with the first parity having the lowest number of weaned piglets (12.84) and the second having the most (19.15). However, the value of this parameter remained relatively stable from the third to the sixth parity. Results consistent with these were also published by Radojković (2007) and Kramarenko et al. (2020).

Piglets born to Large White and F1 sows had similar birth weights because the genotype effect on piglet birth weight was not significant ($p \geq 0.05$) (table 2). These values are close to those reported by Ambroziak and Rekiel (2017) for the Large White x Landrace hybrid - 1.40 kg. The absence of significant differences in this study can be attributed to the similar number of live-born piglets, as this parameter (which is strongly negatively correlated with piglet birth weight) often has a decisive effect on its value.

Table 2. The effect of the examined factors on the weight of piglets at birth and weight of piglets at weaning

		Weight of piglets at birth (kg)		Weight of piglets at weaning (kg)	
		$\bar{x}$	Sd	$\bar{x}$	Sd
Genotype					
Large White		1.390	0.13	5.630 b	0.77
F1		1.405	0.12	5.860 a	0.80
Parity					
I		1.360 b	0.12	5.820 b	0.66
II		1.410 a	0.12	6.261 a	0.77
III		1.416 a	0.13	5.886 b	0.56
IV		1.410 a	0.12	5.461 c	0.71
V		1.380 ab	0.12	5.290 c	0.86
Genotype × Parity					
Large White	I	1.343 c	0.13	5.781 bc	0.72
	II	1.386 bc	0.13	5.910 b	0.70
	III	1.420 a	0.14	5.846 b	0.57
	IV	1.430 a	0.12	5.360 de	0.68
	V	1.394 ab	0.10	5.259 e	0.93
F1	I	1.376 bc	0.10	5.860 b	0.61
	II	1.435 a	0.12	6.613 a	0.68
	III	1.412 ab	0.13	5.926 b	0.55
	IV	1.390 abc	0.12	5.565 cd	0.73
	V	1.371 bc	0.12	5.326 de	0.79
ANOVA					
Genotype		ns		*	
Parity		*		*	
Genotype × Parity		ns		*	

a-e Values within the column with no common superscript are significantly different ($p \le 0.05$)

*$p \le 0.05$, ns - not significant.

On the other hand, the effect of parity on this trait was significant ($p \le 0.05$), so piglets from the first parity had a significantly lower weight compared to piglets from the second, third and fourth parity. This can be explained by the fact that sows at first parity have smaller body dimensions and therefore have less space for piglets in the uterus, while after the second parity, they reach full physical development and the piglet's weight at birth remains at a relatively constant level. Results consistent with this were also published by Quesnel et al.

(2008) who found a significantly lower body weight in piglets from the first compared to piglets from the second parity (1.45 : 1.57 kg; p≤0.05).

When compared to purebred Large White sows, the weight of piglets weaned from F1 sows was considerably higher (p≤0.05). The heterosis effect, which in F1 sows manifests as both improved maternal characteristics and higher milk production, may be one explanation for this difference. The findings of Kremez et al. (2023) and Zhukorskyi et al. (2023) also showed the significant effect of genotype on this trait.

Concerning the effect of parity on this trait, it is evident that the second parity had the largest piglet weight at weaning (p≤0.05), which is to be expected given that sows at second parity usually serve as suckler sows on farms due to their superior piglet raising and highest milk yield. This trait's value starts to decrease in the third parity and reaches its lowest in the fifth. Nojkić (2021) also showed that parity had a substantial effect on this trait, stating that the body weight of piglets at weaning grew from the first parity, when it was minimal (6.63 kg), to the fourth parity, when it achieved its maximum (6.73 kg).

A significant genotype x parity interaction was also recorded for this trait (p≤0.05).

Conclusion

Based on the examination of reproductive traits in 50 Large White and 50 F1 sows in their first five parities, the following conclusions can be drawn:

- There was no significant difference in the number of live-born piglets between Large White and F1 sows (p≥0.05), while parity significantly affected the number of live-born piglets so that with increasing parity the number of live piglets also increased. F1 sows weaned a slightly higher number of piglets compared to purebred sows, but this difference was not statistically confirmed (p≥0.05), while the largest number of piglets were weaned by sows in the second parity, while sows in the fifth parity weaned the least (p≤0.05). Statistical analysis also showed a significant interaction of the examined factors on this trait (p≤0.05).
- Birth weight was not significantly influenced by genotype (p≥0.05), while the effect of parity on this trait was significant, so piglets from the first had a lower weight than piglets from the second, third and fourth farrowing (p≤0.05). The weight of piglets at weaning of F1 sows was significantly higher compared to Large White sows (p≤0.05), while parity influenced this trait in such a way

that the highest weight of piglets at weaning was in the second parity ($p \leq 0.05$), and already from the third parity the value of this trait begins to decline, with the minimum being recorded in the fifth parity. A significant genotype x parity interaction was also recorded for this trait ($p \leq 0.05$).

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