

## **Analysis of gestation length and its influence on the reproductive performance of crossbred sows kept on a large-scale pig farm**

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**The aim of the study was to analyse gestation length in sows raised on a large-scale pig farm and its effect on the sows' reproductive performance. The study was carried out on a total of 556 litters from 92 crossbred sows from the DanBred pig breeding company, obtained by crossing the breeds Danish Landrace and Danish Yorkshire. The research material was divided into 6 groups depending on the length of gestation: group I – gestation length 115 days, group II – 116 days, group III – 117 days, group IV – 118 days, group V – 119 days and group VI – 120 days. The analysis showed that the average gestation length was 117.6 days, with the shortest pregnancy lasting 113 days and the longest 121 days. Among all cases analysed, the most (37%) were those in which the gestation period lasted 118 days. The length of the gestation period was found to influence the number of piglets born dead or mummified, the weaning-to-service interval, and lactation length. Moreover, the length of the gestation period was found to affect that of the following gestation.**

**KEY WORDS: crossbred sows, gestation length, reproductive performance**

Under normal conditions, gestation in sows lasts on average three months, three weeks and three days (115 days). This seems to be confirmed by field research conducted years ago (Fahmy et al., 1971). According to Sasaki and Koketsu (2007), gestation length can range from 105 to 125 days, averaging from 115.2 to 115.4 days, depending on parity. Among all cases analysed, over 70% of pregnancies lasted from 114 to 116 days. Similar results are reported by Belgian researchers (Vanderhaeghe et al., 2011), who analysed nearly 61,000 cases of farrowing and showed that the average gestation length of sows kept on commercial farms is 115.4 days, varying between 109 and 121 days. Variability of this trait is low (Fahmy et al., 1971; Tummaruk et al., 2001). Nevertheless, fluctuations reaching 20 days can affect the length of the farrowing interval, and thus the average number of litters obtained per sow in the herd during the year. Therefore, the purpose of this study was to analyse the length of gestation in a herd of sows kept on a large farm and its impact on their reproductive performance.

## Material and methods

The study material consisted of sows kept on a large farm in the West Pomeranian Voivodeship, with a foundation stock of 3500 sows. The study included a total of 556 litters from 92 crossbred sows from the DanBred pig breeding company, obtained by crossing the breeds Danish Landrace and Danish Yorkshire.

The statistical analysis took into account the following parameters: total litter size, number of live-born piglets, number of stillborn piglets, number of mummified piglets, gestation length, lactation length, weaning-to-service interval, and farrowing interval. The length of the lactation period also included the period when a sow nursed piglets as a foster mother. The farrowing interval included the lactation period, the weaning-to-service interval, and gestation. The calculations took into account sows from which the first to the seventh litters were obtained.

Sows were divided into 6 groups according to gestation length:

- group I – gestation length 115 days
- group II – gestation length 116 days
- group III – gestation length 117 days
- group IV – gestation length 118 days
- group V – gestation length 119 days
- group VI – gestation length 120 days

There were also cases in which gestation lasted 113, 114 or 121 days, but there were very few of these so they were not included in the statistical calculations. Statistical analysis of the research material included determination of phenotypic correlation coefficients between the parameters analysed and one-way analysis of variance, to determine the effect of gestation length on the parameters. Linear relationships between parameters were determined using Pearson phenotypic correlation coefficients. The significance of differences between groups was calculated using the least significant difference (LSD) test. The calculations were carried out using Statistica PL software ver. 13.3.

## Results and discussion

Table 1 presents the breeding performance results of all analysed sows. The average gestation length from the first to seventh pregnancies was 117.6 days, with the shortest lasting 113 days and the longest 121 days. Due to the negligible number of cases of extremely long or short gestation (113, 114 and 121 days), they were omitted from the calculations. Numerous authors, including Fahmy et al. (1971), Sasaki and Koketsu (2007), Rydhmer et al. (2008), Vanderhaeghe et al. (2011), and Nevrkla and Hadaš (2014), report shorter gestation in sows. The average litter size was 15.91 and average number of live-born piglets per litter was 15.13. An analysis of the breeding performance of sows kept in breeding herds, carried out in 2018, showed that Polish Large White sows gave birth to 12.37 live piglets per litter, and Polish Landrace sows to 12.27 (Mucha, 2019).

**Table 1**  
Characteristics of the research material

Traits	Number of litters	Average	Standard deviation	Min.	Max.
Number of piglets born per litter	556	15.91	3.399	3	24
Number of piglets born alive	556	15.13	3.280	3	24
Number of stillborn piglets	556	0.60	0.779	0	5
Number of mummified piglets	556	0.18	0.426	0	2
Gestation length from parity 1 to 7 (days)	556	117.60	1.304	113	121
Lactation length (days)	543	27.46	5.044	17	60
Weaning-to-service interval (days)	466	7.66	9.250	1	65
Farrowing interval (days)	466	153.0	11.045	138	218
Gestation length from parity 2 to 7 (days)	466	117.7	1.259	113	121

Table 2 presents correlation coefficients between gestation length and the breeding performance of sows. Correlation coefficients are presented separately for parity 1 to 7 and parity 2 to 7. They show that the longer the gestation (not taking into account the first parity), the more dead and mummified piglets were born. These relationships were statistically significant at  $P \leq 0.05$ . Furthermore, the longer the pregnancy lasted (not taking into account the first pregnancy), the significantly shorter the feeding period, which was confirmed statistically ( $P \leq 0.05$ ). Sasaki and Koketsu (2007) came to similar conclusions, finding that the lactation period in sows with shorter gestation was significantly longer than sows whose gestation was longer. A difference in gestation length of just one day significantly shortened the lactation period.

Table 3 presents the results regarding the effect of gestation length on reproductive parameters of sows and the significance of differences between groups. The gestation length for each group included all reproduction periods from 1 to 7. There were 6 groups in which gestation lasted from 115 to 120 days. The numbers of observations analysed for each group were as follows: group I (115 days) – 15, group II (116 days) – 65, group III (117 days) – 123, group IV (118 days) – 183, group V (119 days) – 89, and group VI (120 days) – 19. Nearly 62% of pregnancies lasted 117 or 118 days, and only 3% lasted 115 days. It is worth noting that the difference in gestation length can be up to 8 days, which

**Table 2**  
Phenotypic correlation coefficients between gestation length and reproductive performance traits in sows

Traits	Gestation length	
	from 1 to 7	from 2 to 7
Number of piglets born per litter	-0.0641	0.0834
Number of piglets born alive	-0.0700	0.0468
Number of stillborn piglets	0.0557	0.1133*
Number of mummified piglets	-0.0659	0.1133*
Farrowing interval	-0.0610	0.0034
Weaning-to-service interval	-0.0780	-0.0555
Lactation length	-0.0549	-0.0981*

\* $P \leq 0.05$

can affect the length of the breeding period, and thus the average frequency of farrowing in the herd. Our research shows that pregnancy in sows on a large farm can last as long as 121 days. Research by Sasaki and Koketsu (2007) conducted on larger numbers of sows showed that gestation length can reach up to 125 days. Gestation length was found to affect the number of stillborn and mummified piglets, the weaning-to-service interval, and lactation length. Furthermore, the length of the preceding pregnancy was found to affect the length of the pregnancy following it. The most stillborn piglets (0.947) were recorded in litters of sows with the longest gestation period (group VI), while the fewest (0.533) were noted in group IV. According to Herpin et al. (2001), as litter size increases, the length of parturition increases, and hypoxia symptoms may appear in piglets born at the end of parturition, which in turn increases the probability of stillbirths. The lack of significant differences in this parameter between the groups with its highest and lowest values is probably due to the small size of group VI (19 cases), as well as the high variability of the trait. Schwarz et al. (2009) reported similar numbers of stillborn piglets to the maximum values obtained in our study, while Milewska (2006) reported results similar to the lower values. A statistically significant ( $P \leq 0.05$ ) difference in the number of stillborn piglets was noted between groups III (0.533) and IV (0.732). It is worth adding that the number of stillborn piglets was relatively low for all the research material and amounted to 3.8% of piglets born in the litter.

**Table 3**  
Effect of gestation length on analysed traits

Traits		Group (gestation length in days)						P value
		I (115)	II (116)	III (117)	IV (118)	V (119)	VI (120)	
Number of piglets born per litter	$\bar{x}$	15.33	16.08	16.27	15.67	15.40	16.11	0.4737
	S	3.155	3.232	2.986	3.541	3.953	3.071	
Number of piglets born alive	$\bar{x}$	14.47	15.35	15.25	15.00	14.66	14.95	0.7443
	S	2.800	3.300	2.884	3.394	3.864	2.934	
Number of stillborn piglets	$\bar{x}$	0.535	0.569	0.732 <sup>a</sup>	0.533 <sup>b</sup>	0.629	0.947	0.1204
	S	0.834	0.684	0.850	0.739	0.760	0.705	
Number of mummified piglets	$\bar{x}$	0.333	0.154 <sup>a</sup>	0.284 <sup>bA</sup>	0.137 <sup>B</sup>	0.112 <sup>B</sup>	0.210	0.0199
	S	0.617	0.364	0.536	0.360	0.411	0.419	
Gestation length from parity 2 to 7	$\bar{x}$	117.0 <sup>aA</sup>	117.2 <sup>aA</sup>	117.7 <sup>bC</sup>	117.8 <sup>BC</sup>	118.2 <sup>B</sup>	118.5 <sup>B</sup>	0.0000
	S	1.000	1.964	1.015	0.918	1.038	1.125	
Farrowing interval	$\bar{x}$	150.5	155.7	153.6	152.9	151.7	152.6	0.4058
	S	8.717	13.724	12.639	9.980	8.965	13.435	
Weaning-to-service interval	$\bar{x}$	6.47	10.70 <sup>a</sup>	8.05	7.27 <sup>b</sup>	6.99 <sup>b</sup>	7.29	0.2606
	S	6.512	13.220	10.425	8.132	8.012	6.302	
Lactation length	$\bar{x}$	27.00	27.36	28.15 <sup>a</sup>	27.55	26.32 <sup>b</sup>	26.63	0.2085
	S	4.676	4.565	5.039	5.186	4.274	8.877	

a, b – means with different superscripts differ significantly at  $P \leq 0.05$

A, B, C – means with different superscripts differ significantly at  $P \leq 0.01$

The most (0.333) mummified piglets were born to sows whose gestation lasted 115 days (group I). Only 15 cases were analysed in this group, which explains the lack of statistically confirmed differences. Statistically significant differences at  $P \leq 0.01$  were found for group III (0.284) vs groups IV (0.137) and V (0.112), and at  $P \leq 0.05$  between groups II (0.154) and III (0.284). There was no statistically confirmed effect of gestation length on the total litter size or the number of live-born piglets in the litter. Nevertheless, in the larger groups (from II to V), there was a tendency towards more live-born piglets from sows with a shorter gestation period. Chen et al. (2010) and Imboonta and Kuhaudomlarp (2012) report a similar distribution of results for this parameter. Rydhmer et al. (2008) came to different conclusions, finding that an increase in the gestation period from 114 to 119 days resulted in a reduction in litter size. Sasaki and Koketsu (2007) showed that sows in which gestation lasted between 113 and 116 days gave birth to more live piglets than sows with extremely short (less than 112 days) or extremely long (over 117 days) gestation.

The group II sows, in which gestation lasted 116 days, required the most time to rest before service after rearing their piglets (10.70 days). Statistically significant differences ( $P \leq 0.05$ ) were found between this group and groups IV and V, in which the weaning-to-service interval was on average more than three days shorter. Tummaruk et al. [2001], in a study on sows of the Swedish Landrace and Yorkshire breeds, recorded a shorter weaning-to-service interval of 5.5 to 6.6 days depending on parity; it was longest in primiparous sows and shortest in the fifth reproduction cycle. The lactation period was longest in sows from group III (28.15 days) and shortest in group V (26.32 days). A statistically significant ( $P \leq 0.05$ ) difference was noted between these groups. This indicates that after a long gestation period sows nurse their piglets for a shorter time.

The length of the preceding pregnancy was also found to affect the length of the pregnancy following it. Statistically significant differences ( $P \leq 0.01$ ) were shown for groups I and II vs groups IV, V and VI as well as for groups III and IV vs groups V and VI. Less significant, but statistically confirmed ( $P \leq 0.05$ ) differences were noted for groups I and II vs group III. When the previous pregnancy lasted 115 (group I), 116 (group II) or 117 (group III) days, the subsequent pregnancy lasted 2.0, 1.24 and 0.65 days longer, respectively. In sows whose previous pregnancy lasted 118 days (group IV), the subsequent pregnancy lasted only 117.8 days. A subsequent pregnancy longer than 118 days was noted only for sows whose previous gestation lasted 119 (118.2) or 120 days (118.5).

Due to the low heritability of reproductive performance parameters, achieving significant advancements, especially in farm conditions, requires proper herd management and organization of breeding (Koketsu et al., 2017; Patterson and Foxcroft, 2019). The average number of piglets reared by a sow during the year can be increased by increasing the frequency of farrowing in the herd, which depends on the length of the farrowing interval. Shortening the farrowing interval may increase the frequency of farrowing. The length of the farrowing interval depends in turn on the length of lactation period, the weaning-to-service interval, and gestation.

## **Conclusions**

To sum up, gestation lasting 116 days should be considered optimal in terms of the number of live-born piglets and the number of stillborn and mummified piglets. At the same time, sows with a gestation period of 116 days required more time to rest after rearing larger litters. It should also be noted that extension of the gestation period on the large-scale farm did not significantly prolong the farrowing interval, which was relatively short, ranging from 150.5 to 155.7 days. A slight extension of the farrowing interval by just five days may therefore not have significantly reduced the frequency of farrowing in the herd or the number of piglets reared. The fact that longer gestation did not affect the length of the farrowing interval can probably be explained by its relatively minor increase relative to the total gestation length, of which five days amounts to only 4%. This suggests that the length of the farrowing interval may depend more on the length of the weaning-to-service interval than on gestation length. Under normal conditions, the weaning-to-service interval should not last more than a few days. However, if oestrus does not occur within a few days after the piglets are weaned, the next opportunity for conception may not arise until the next oestrous cycle, after 21 days. Compared to the average duration of 7.7 days, extension of the weaning-to-service interval by another oestrous cycle represents an increase of over 270%. This suggests that on large-scale farms, the length of the weaning-to-service interval may play a greater role than gestation length in extending the farrowing interval and thus decreasing farrowing frequency. However, this hypothesis requires verification and further analysis on more extensive research material.

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