THE INFLUENCE OF SEASON ON THE REPRODUCTIVE TRAITS OF PIGS

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Abstract

The aim of the work was to analyze the influence of the season on the reproductive parameters of pigs. In the experiment, sows of the Large White breed were analyzed in the 2nd - 5th litter on the commercial pig farm. It can be concluded, from the analysis of the obtained results, that the most favorable reproductive parameters per litter were achieved by the sows in the spring and autumn seasons (the number of the liveborn piglets was 11.8 and 11.5 and the number of the weaned piglets was 9.7 and 10.1). The worst reproductive parameters per litter were achieved by the sows in the summer season, where the lowest number of the liveborn piglets (10.8), weaned piglets (8.5), the highest preweaning mortality (2.3) and the longest farrowing interval (172 days) was recorded. The results show that the summer period in our climatic zone represents a critical period of the year, during which it is necessary to pay an extra attention to the control of microclimatic conditions in the pig housing.

Key Words: Pigs; reproduction; season

The reproductive performance of pigs can significantly affect the efficiency of pig production (Rekwot et al., 2001). The primary parameters used to measure the reproductive performance of sows include: the number of litters, litter size at birth, litter size at weaning and the fertility index (Yilma, 2017). According to Patterson et al. (2010), on average, sows are able to raise 30 - 40 piglets per year.

The reproductive indicators can be affected by the season, parity, breed, length of lactation and nutrition (Bloemhof et al., 2008). A very important moment in the reproduction process is considered the period of insemination, fertilization, nidation of embryos (Knecht and Duziński, 2014), as well as the period of parturition, which affects the reproductive performance by affecting the size of the litter and the survival of piglets after birth (Tummaruk et al., 2010). Changes in temperature and the light regime during the season are considered to be the main causes affecting the fertilify degree (Knecht et al., 2013). Factors such as a year, farrowing season and litter order can directly affect the pig production volume, therefore it is important to carry out a detailed analysis of how these factors affect the reproductive performance (Hagan & Etim, 2019). Furthermore, inaccurate records of reproductive performance have economic implications associated with unreliable pedigree information making it difficult to develop well-organized breeding programs in order to facilitate genetic improvement (Chimonyo & Dzama, 2007; Ilatsia et al., 2008).

In connection with the mentioned information, the aim of the experiment was to assess the effect of the season on reproductive indicators of pigs.

Material and Methods

Biological Material and Breeding Environment

In the experiment, the reproductive parameters of 200 sows of the Large White breed from the second to the fifth litter were analyzed. Dry sows were housed in individual pens until the pregnancy was detected on the 28th - 35th day.

Dry sows were fed with a feed dose of 2.1 kg per sow until the pregnancy was detected. After the pregnancy had been detected, the dry sows were housed in groups. Feeding was carried out by means of the automatic feeding machines. The feed ration was increased to 2.3 - 2.7 kg/sow/day until the 80th day of pregnancy, and from the 80th day of pregnancy the feed ration was increased to 3.2 - 3.4 kg until the transfer to the farrowing crates. At breeding time and pregnancy, the sows were fed complete feed mixture for pregnant sows. 7 to 10 days before the planned farrowing, the sows were moved to a clean and disinfected farrowing room, where they were housed in the farrowing crates with permanently restricted movement. During lactation, the sows were fed 2 times a day with the complete feed mixture for lactating sows. Before farrowing, the feed ration was 2.9 - 3.1 kg/ sow/day, after farrowing, it was gradually increased according to the number of piglets by 0.5 kg until the 5th - 6th day.

The ventilation in the housing was controlled automatically based on the internal temperature and relative humidity. Fresh air from the outside environment was supplied through the ventilation flaps located along the side walls of the pens. Polluted air was removed by means of he vacuum fans located in the ceiling space. Manure from the dry sows at breeding time and lactating sows was removed manually on a daily basis. During the group housing of the pregnant sows, the manure was removed through a built-in sewer with an overflow grate located in the back of the pens.

Monitored Reproductive Parameters and Breeding Environment Factors

During the experiment, the following indicators were monitored: the number of all born piglets per litter, the number of liveborn piglets per litter, the number of stillborn piglets per litter, the number of weaned piglets per litter, the number of dead piglets per litter and the length of the farrowing interval in days.

The mentioned reproductive parameters were evaluated in relation to the seasons: the spring season from 21st March - 20th June (number of litters - 179), the summer season from 21st June – 22nd September (number of litters - 217), the autumn season from 23rd September – 21st December (number of litters - 206), the winter season from 22nd December – 20th March (number of litters - 198).

Statistical Analysis

The obtained results were analyzed using the version 9.1 of the SAS program. The comparison of groups was performed using the analysis of the variance ANOVA, testing the contrasts by means of the Scheffe test at the level of significance $p<0.05$.

Results and Discussion

Table 1 shows the values of the sows' reproductive indicators and the number of the weaned and dead piglets per litter according to a particular season of the year. In the indicator, the number of all born piglets, the largest number was found in the autumn period (13.8 piglets) and the lowest number in the summer period (12.4 piglets). There was a statistically significant difference ($p<0.05$) between the autumn and other seasons of the year. From the point of view of the prenatal development of piglets, the autumn period was the most suitable. Bloemhof et al., 2008 report that the litter size at birth and weaning are among the primary parameters used to measure the reproductive performance of sows and they can be influenced by the season, parity, breed and nutrition. The highest number of liveborn piglets was evidently recorded in the spring season (11.8 piglets) and the lowest one in the summer season (10.8 piglets) ($p<0.05$). This difference was represented by one piglet, which is very significant from breeding and an economic points of view. In the autumn period, the number of liveborn piglets was higher by 0.5 piglets compared to the winter period, but this difference was not statistically significant. Also Knecht et al. (2015) noted a significant decrease in the number of piglets born alive in the 3rd and 4th litter in the Polish Landrace breed. The number of stillborn piglets was considered the lowest in the spring

period (1.3 piglets), followed by the summer period (1.6 piglets) and the winter (1.9 piglets), and it was considered the highest in the autumn period (2.3 piglets) ($p<0.05$). The highest number of the stillborn piglets in the autumn period can be explained by the effect of high temperatures in the course of pregnancy in the summer period, because the heat stress can disrupt fetal development (Nardone et al., 2010).

The number of the weaned piglets is the most important indicator from the point of view of breeding economics. Despite the highest number of the stillborn pigs in the autumn period (2.3 piglets), the highest weaning rate (10.1 piglets) was evidently achieved ($p<0.05$) in this period. The lowest weaning ($p<0.05$) was evidently considered in the summer period (8.5 piglets). Preweaning mortality was greatest in the summer period (2.3 piglets) and in the spring period (2.1 piglets). The lowest mortality was found out in the autumn period (1.4 piglets). Statistical significance ($p<0.05$) was found among the spring, autumn and winter seasons as well as among the summer, autumn and winter seasons. Sows are sensitive to high temperatures, mainly due to a reduced ability to perspire (Nardone et al., 2010). Towards the end of pregnancy, it is very important to monitor the condition of sows due to the performance of sows during lactation (Beyga and Rekiel, 2010). Physiological changes during parturition and lactation are compounded by feed change, postnatal stress and microclimatic factors (Quesnel et al., 2009). Physiological changes during parturition and lactation are multiplied by the feed change, postnatal stress and microclimatic factors (Quesnel et al., 2009). Therefore, heat stress during the summer period can lead to changes in the composition of milk, less milk secretion or reduced food consumption by piglets (Knecht et al., 2015). The mentioned effects are also confirmed by the results of the experiment, as the highest mortality of sucklings and the lowest weaning rate were recorded in the summer period.

Table 2 shows the length of the sows' farrowing interval, which was most favorable in the spring period (143 days) and in the winter period (151 days). In summer and autumn, the length of the farrowing interval was significantly longer compared to the spring and autumn seasons of the year ($p<0.05$).

Table 1. Effect of the Seasons on the Number of the Piglets per litter and Preweaning mortality

Indicator (number)	Spring (n=179)	Summer (n=217)	Autumn (n=206)	Winter (n=198)	Significance
All born piglets	13.1 ± 1.3^{a}	12.4 ± 2.4^{a}	13.8 ± 1.9^{b}	12.9 ± 2.1^{a}	$p<0.001$
Liveborn piglets	11.8 ± 1.1^{a}	10.8 ± 2.3^{b}	11.5 ± 1.6^{ab}	11.0 ± 1.9^{ab}	$p<0.05$
Stillborn piglets	1.3 ± 0.3^{c}	1.6 ± 05^{b}	2.3 ± 0.7^{a}	1.9 ± 0.6^{b}	$p<0.05$
Weaned piglets	9.7 ± 2.2^{b}	8.5 ± 1.8^{c}	10.1 ± 1.5^{a}	9.3 ± 1.9^{b}	$p<0.01$
Preweaning mortality	2.1 ± 0.8^{a}	2.3 ± 0.6^{a}	1.4 ± 0.5^{c}	1.7 ± 0.4^{b}	$p<0.05$

Indices a, b, c in the rows represent differences among the groups at the level of significance ($p<0.05$)

Table 2- Effect of the Season on the Sows' Farrowing Interval

Indicator (days)	Spring (n=137)	Summer (n=159)	Autumn (n=162)	Winter (n=142)	Significance
Farrowing Interval	143 ± 19.4^{b}	172 ± 17.7^{a}	160 ± 15.6^{a}	151 ± 16.9^{b}	$p<0.01$

Indices a, b in the rows represent differences among groups at the level of significance ($p<0.05$)

Conclusion

Global climate changes bring problems to pig breeders in terms of the temperature regime in housing, which is also reflected at the level of the achieved reproductive results. Despite the regulated ventilation in the housing, it is problematic to maintain an optimal microclimate during hot summer days, which is one of the decisive factors affecting the animal performance. It has also emerged from the results of the experiment that the summer represents a critical period during the year, in which there was a demonstrable reduction in reproductive efficiency. The results of the experiment point to the importance of controlling the microclimate conditions in the housing.

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