

INFLUENCE OF THE AGE OF THE FIRST INSEMINATION ON SOME REPRODUCTIVE INDEXES IN SOWS

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Abstract: The aim of the study was to establish the influence of the month and the year of birth of gilts from the hybrid combination 'Y' ((Tai Zumu x Landrace) x Large White), as well as of the age of the first insemination on the age of the first mating, the first farrowing, the duration of pregnancy, and the total number of born piglets. The experimental animals were divided into three groups depending on the age of the first insemination (by the 249th day (n=71), from the 250th to the 271st (n=42), and after the 272nd one (n=20). The average age of the first insemination and the first mating was respectively 258.8 ± 0.78 and 276.71 ± 3.54 days, on average. The age of the first farrowing was 391.56 ± 3.54 on average, and the duration of pregnancy – 115.03 ± 0.2 days. The total number of born piglets in a litter was 11.87 ± 0.32 pigs on average. The age of the first insemination has a reliable influence on the age of the first mating and the first farrowing ($p < 0.001$), as well as on the number of born piglets ($p < 0.05$). The month ($p < 0.001$) and the year of birth of the gilt pigs ($p < 0.05$) have reliable influence on the age of the first insemination.

Key words: sows, insemination, fertilization, gestation, number of piglets, reproduction

Introduction

The increased worldwide demand for meat gives advantage of the fast-growing species such as pigs, and turns pig-breeding into one of the leading sub-branches of stock-breeding. At the same time, the population on the planet is expected to increase with 2 to 4 billion by 2050 (Cohen, 2003). This gives grounds of the scientific researches and the producers of pig-breeding production to adapt to these tendencies in order to satisfy the needs of the population (Miclea et al. 2009).

The improvement of the reproductive abilities of the pigs is of significant importance since it also has an influence on the born piglets and their productive

abilities (Miclea *et al.* 2007, 2009). According to the same authors, the highly specialized hybrid parental forms allow them to be used for breeding from younger age, but at the same time, the indications of estrus of these animals become weaker.

The lifelong productivity and longevity of breeding stock are of significant importance for the successful management of pig farming. The increased duration of use and the high productivity of sows reduce the expenses for the purchase of gilt pigs and increase the effectiveness and profitability of the group of pigs (Sasaki and Koketsu, 2008, Saito *et al.*, 2011). In this regard, the age of the first insemination can be defined as a key factor, defining the productivity and longevity of the sows.

All this gave us a reason to analyze the influence of the age of the first insemination on the age of the first mating and first farrowing, the duration of the pregnancy and the total number of born piglets.

Materials and Methods

The study included a total of 133 gilt pigs of the hybrid 'Y' ((Tai Zumu x Landrace) x Large White), born in December 2012 and in January and February 2013, and bred in a pig farm located in the region around the town of Plovdiv, Bulgaria.

The stock was inseminated twice during the estrus, with sperm of imported terminal boars 'D' (Large White x Pietrain). The first insemination was not done earlier than the time of the first registered estrus after reaching sexual maturity. The duration of pregnancy was registered from the first day of artificial insemination to the day of labor.

The experimental animals were divided in three groups depending on the age of the first insemination (by the 249th day (n=71), from the 250th to 271st one (n=42), and after the 272nd day (n=20).

The following indications were studied:

- The age of the first insemination, days
- The age of the first mating, days
- The age of the first farrowing, days
- Duration of the pregnancy, days
- Total number of born piglets.

In the course of the study, the influence of the age group on first insemination as well as the month and the year of birth of the gilt pigs on the studied indications was analyzed.

In data processing, we used a multi-factor dispersion analysis of software product SPSS 19.

Results and Discussion

Table 1 shows the average value (LS) of the indicators, characterizing the reproductive ability of gilt pigs, as well as the total number of born piglets in a litter.

Table 1 Reproduction traits of hybrid sows (n=133)

Traits	LS	±SE	Cv, %
Age of 1-st insemination	258.81	0.78	7.37
Age of 1-st fertilization	276.71	3.54	14.35
Age of 1-st farrowing	391.56	3.54	10.03
Gestation duration	115.03	0.2	1.73
Number of piglets at birth	11.87	0.32	28.68

The productivity of pigs in a long-term plan depends largely on the age, in which gilt pigs start their reproductive life (*Babot et al.*, 2003). According to a number of authors (*Schukken et al.*, 1994; *Xue et al.*, 1996) the optimal age of the first insemination is between 200 and 260 days. According to the latter, the recommended age range is too big since the ability of pigs to express estrus in this time frame is too variable.

The average age of the first insemination of the gilt pigs in our experiment was 258.81 ± 0.78 days. The age of the first mating and the first farrowing was 276.71 ± 3.54 and 391.56 ± 3.54 days, respectively. The average duration of the period of pregnancy of the gilt pigs was 115.03 ± 0.2 days, which is within the limits of the norm for the age. The coefficient of variation under this indication was 1.73%, which corresponds to the one established by *Miclea et al.*, (2009). The authors define limits of duration of pregnancy in gilt pigs of the Camborough hybrid from 114.42 to 116.70 days, with variation under this indication – around 2%. A number of live born piglets in the litter is one of the most studied genetic traits (*Popovac et al.* 2012). *Vidovic et al.* (2012) reported for 11,4 average number alive born piglets from purebred female Landrace. In the conditions of this study, the average number of born piglets was 11.87 ± 0.32 . For similar coefficient of variation (28.16%) for number of born alive piglets reported *Radojković et al.* (2007) in experiments with Swedish Landrace sow on three farms in Serbia.

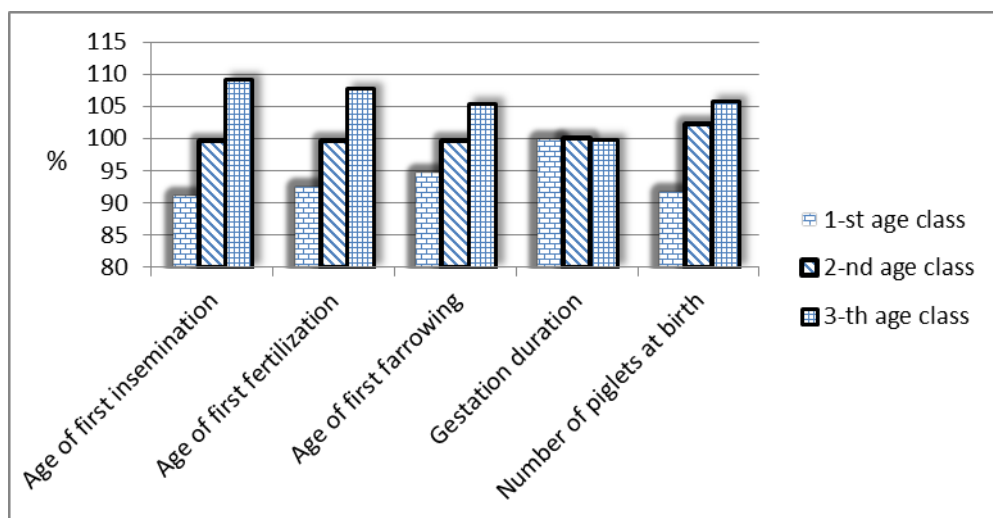
The factors studied by us have a reliable influence on the reproductive abilities except the duration of pregnancy (Table 2). The age of the first insemination has a reliable influence on the age of the first mating and the first farrowing ($p < 0.001$), as well as on the number of the born piglets ($p < 0.05$). The month ($p < 0.001$) and the year of birth of the gilt pigs ($p < 0.05$) have reliable influence on the age of the first insemination.

Table 2. The effect of the month and the year of birth, and the age class on the reproductive traits of sows

Model	Factor	F- criterion and degree of reability				
		Traits				
		Age of 1-st insemination	Age of 1-st fertilization	Age of 1-st farrowing	Gestation duration	Number of piglets at birth
1.	Year of birth	4.61*	0.001	0.002	1.91	0.02
2.	Month of birth	8.30***	0.66	0.68	1.02	0.98
3.	Age class	293.17***	11.57***	11.26***	0.37	3.04*
4.	-Year	2.01	0.5	0.6	1.84	0.1
	-Age class	284.2***	11.76***	11.5***	0.35	3.06*

***P<0.001, **P<0.01, *P<0.05

The changes of the indicators characterizing the reproductive ability of pigs depending on the group they refer to according to the age of the first insemination are presented in Figure 1.

Figure 1. Variability of reproductive indices of sows depending on the age class of first insemination (like deviation of mean, %)

The average age of the first insemination in the first group was 236.32 ± 0.94 , 257.62 ± 1.22 days in the second one, and 282.5 ± 1.77 days in the third one. All three groups were homogeneous which is also proved by the coefficient of variation – 7.37%. There was also a similar distribution of the relative values in the other two studied indicators – the age of the first mating and first farrowing. They were lowest in the first group and highest – with the pigs in the third age class.

The duration of pregnancy in the first and second age class was practically the same, and with the animals inseminated for the first time after the 272nd day it was 0.42 days shorter.

The influence of the age of the first insemination plays an important role for the reproductive qualities of pigs in their first farrowing, especially on the number of live born piglets (*Babot et al., 2003*).

A number of authors state of an increase of multiple pregnancy with the advancing of age on insemination (*Archibong et al., 1987; Beltranena et al., 1991*), which they explain with the fact that the increase of the age of the first insemination probably increases the number of estruses, and consequently the level of ovulation.

In our experiment, the age of the first insemination had a significant effect on the number of born piglets ($p < 0.05$). *Radojković et al. (2007)* also established a significant effect ($p < 0.01$) on the same trait on the age of first farrowing. Figure 2 shows that the gilt pigs of the first class had the least number of pigs – 10.9 ± 0.38 pigs, which is around 8% lower than the average for all the animals. The sows from the third age group gave birth to an average of 12.55 ± 0.73 pigs, which is nearly 6% more compared to the average value of this indication. Gilt pigs, inseminated within the limits from the 250th to the 271st day after their birth, take an average position in the number of born piglets.

Conclusion

The average age of the first insemination and first mating in the conditions of our experiment was 258.8 ± 0.78 and 276.71 ± 3.54 days on average, respectively. The age of the first farrowing was 391.56 ± 3.54 on average, and the duration of pregnancy – 115.03 ± 0.2 days. The total number of born piglets in a litter was 11.87 ± 0.32 pigs on average.

The age of the first insemination had a reliable influence on the age of the first mating and first farrowing ($p < 0.001$), as well as on the number of born piglets ($p < 0.05$).

The month ($p < 0.001$) and the year of birth of the gilt pigs ($p < 0.05$) have reliable influence on the age of the first insemination.

Uticaj uzrasta pri prvom osemenjavanju na neke reproduktivne indekse krmača

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Rezime

Cilj istraživanja je bio da se utvrdi uticaj meseca i godine rođenja nazimica iz hibridne kombinacije 'Y' ((Tai Zumu x landras) x velika bela), kao i uzrasta pri prvom osemenjavanju, na uzrast pri prvom parenja, prvom prašenju, trajanju steonosti, i ukupni broj rođene prasadi. Ogledne životinje su bile podeljene u tri grupe u zavisnosti od starosti pri prvom osemenjavanju (do 249. dana ($n = 71$), od 250. do 271. ($n = 42$), i nakon 272. dana starosti ($n = 20$)). Prosečan uzrast pri prvoj inseminaciji i prvom parenju je bio $258,8 \pm 0,78$, odnosno $276,71 \pm 3,54$ dana. Uzrast pri prvom prašenju je bio $391,56 \pm 3,54$ u proseku, i trajanje gestacije - $115,03 \pm 0,2$ dana. Ukupan broj rođenih prasadi u leglu je bio $11,87 \pm 0,32$ u proseku. Uzrast pri prvom osemenjavanju ima pouzdan uticaj na uzrast pri prvom parenju i prvom prašenju ($p < 0,001$), kao i na broja rođenih prasadi ($p < 0,05$). Mesec ($p < 0,001$) i godina rođenja nazimica ($p < 0,05$) ima pouzdan uticaj na uzrast pri prvom osemenjavanju.

Ključne reči: krmače, osemenjavanje, fertilizacija, gestacija, broj prasadi, reprodukcija

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