RELATIONSHIP BETWEEN SOME MORPHOMETRIC TRAITS OF REPRODUCTIVE SYSTEM OF PRIMIPAROUS SOWS AND THEIR FERTILITY

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Abstract

The aim of the study was to evaluate the relations between some morphometric traits of reproductive system of primiparous sows determined after slaughter and their fertility. The animal material was group of primiparous sows. At age 140 days animals were fed with the "insulingenic diet" (21 days). Gilts were divided in two groups A and B, and were mated at first or second estrus. After pregnancy, farrowing, lactation and weaning piglets, the sows were slaughtered, and their reproduction systems were evaluated. All calculations were performed using the statistical package STATISTICA 8 PL. Number of born piglets in group of sows mated at first estrus was lower than in group of sows mated at second estrus (8.70 versus 10.05). Differences between A and B groups was highly statistically significant ($P \leq 0.01$). Positive statistically significant correlations was shown between fertility of sows mated at first estrus and left ovarian weight ($r = 0.49$; $P \leq 0.05$) and between the number of piglets and uterus-cervix length in sows from group B ($r = 0.40$; $P \leq 0.05$). Moreover, interrelations between each of elements reproductive system (uterus with ligament weight, uterus capacity, ovaries weight, cervix-uterus and horns length) were noted at $P \leq 0.01$ and at $P \leq 0.05$.

Key Words: First farrowing sows, reproduction, piglet breeding effects

The issue of reproduction in pig keeping and breeding constitutes a phase directly influencing the consecutive production stages by providing an appropriate amount of animals. With reference to the above, high fertility and prolificacy of sows is to be regarded with utmost attention and concern. The fact that breeding performance traits are not highly heritable restrains the chances for improving their quality through the selection process. It is furthermore difficult to estimate the reproductive abilities of replacement gilts introduced to the foundation stock on the basis of their pedigree – ancestors' performance. Those methods are therefore sought, which would allow, with a considerable degree of probability, to indicate the fertility of gilts prior to their introduction to the foundation stock.

It is assumed that certain correlations may appear between the morphometric parameters of reproductive organs established in vivo or *post mortem* and the features of breeding performance.

The aim of the study was to determine the relations between some morphometric traits of reproductive tract and litter size in sows mated in first or second estrus.

Material and methods

The research material comprised of a group of 70 crossbred gilts (wbp x pbz). From the 140th day of their life and for a period of 21 days, the animals received the so-called insulinogenic diet – flushing. The experimental gilts were divided in two groups, depending on the date of their mating: in the I estrus (group A), in the II estrus (group B).

The estrus was controlled twice a day and its intensification was established according to the scale developed by Karalus et al. (1990). Upon the undergone pregnancy and piglet rearing (21 days), the sows from both groups were slaughtered 10 days from weaning the piglets. A morphometric assessment has been carried out with regard to the reproductive organs, with a focus on: the weight of the uterus and ovaries, with an accuracy respectively of up to 1 g and 0.01 g, length of the uterine horns with an accuracy of up to 0.5 cm. The uterus volume (cm^3) was also established by means of the Kwaśnicki's method (1951) with further modifications for the purpose of analysing the volume of the cavernous organs.

The obtained results have been processed statistically. The significance of differences between the means was verified through a t-test. The interdependence between the selected morphometric features of reproductive organs and fertility was estimated by calculating simple correlations with the aid of the Statistica 8 PL computer software.

Results and discussion

The values of the selected morphometric parameters of reproductive organs of the sows mated in the estrus I or II are presented in table 1 (for group A and B respectively). One of the features assessed was the length of the cervix. The gilts mated in II estrus revealed longer cervixes – 17.41 cm, as compared to the gilts mated in I estrus – 15.08 cm ($P \leq 0.01$). The sows with the longer cervix (group B) gave birth to a larger amount of piglets in the

litter, as compared with the animals from group A – 1.35 piglets more (10.05 to 8.70) – Table 1. The identified difference turned out to be statistically significant.

The correlation between the gilts' length of vagina and cervix and the number of piglets born in litter was also presented in a research by Rillo et al. (2001). The authors stated that the sows with longer (in vivo) vagina and cervix born more piglets. The study by Dybała et al. (2004) gave similar results. It was proved that sows with longer vaginas and cervixes gave litters 0.98 piglet larger than the animals which proved to have shorter measurable reproductive tracts.

One of the features that may indicate reproductive abilities of sows may be the uterus volume. The sows from group A had a mean uterus volume of 532.56 cm^3, the sows from group B on the other hand – 814.56 cm^3 (table 1). The identified difference turned out to be statistically significant ($P \leq 0.01$). The sows with higher uterus volume born larger litters as well, a fact that the late mating, i.e. in II estrus, may have contributed to.

In the research carried out by Szostak and Sarzyńska (2005) it has been stated that large uterus volume was a trait visible in older sows. The conclusion is that the dimensions and weight of reproductive organs of sows are to a large extent determined by the age of the animals. Vianna et al. (2004) have also proved that the volume of the sow's uterus influences the litter size. The mating date is undoubtedly another factor influencing the litter sizes – whether it takes place during the first or the second estrus. Numerous results of studies indicate that the number of the ovulating ovarian follicles during the first estrus is smaller than in those to follow (Bidanel et al. 1996; Germanova 1996).

Table 2 presents the correlation between morphometric features of the reproductive organ of sows mated in the I estrus and their fertility. The statistically significant correlation r = 0.49 appeared only between the weight of the left ovary and the number of piglets born in the litter. This particular correlation may result from the fact that usually slightly more egg cells mature in the left ovary (51 – 55%) than in the right one (49 – 45%), (Grudniewska 1998).

A series of positive correlations has also appeared between the specific parameters of the gilts' reproductive system. A highly significant correlation has been observed between the weight of the uterus with ligament, the length of the right uterine horn (r = 0.52), the length of the left uterine horn (r = 0.53) and the uterus volume (r = 0.52), as well as the weight of the left ovary (r = 0.48). Furthermore, the length of the cervix was highly significantly correlated with the uterus volume (r = 0.50). Additional highly significant correlations were observed between the right and the left uterine horn (r = 0.90) and between the right and the left ovary (r = 0.48).

Table 3 presents the correlations between the morphometric parameters of reproductive organs and the fertility of sows first mated in the II estrus. The number of piglets born by sows from this group was significantly correlated with the length of the cervix (r = 0.40). With regard to the sows from this group a series of positive significant and highly significant statistically correlations has also been recognized between the particular traits of the reproductive system, similar to group A.

Table 1. Parameters of reproductive organs in gilts mated at first or second estrus

Traits	**Group gilts**	
	A- mated in I estrus	**B - mated in II estrus**
Number of gilts	34	36
Live body weight, kg	150.59 ± 17.97	153.72 ± 14.92
Uterus with ligament, g	795.75 ± 313.36	991.62 ± 239.80
Vagina-cervix length, cm	15.08^{B} ± 1.97	17.41^{A} ± 2.46
Right uterus horn length, cm	100.52 ± 32.63	103.46 ± 35.23
Left uterus horn length, cm	100.44 ± 35.37	103.67 ± 37.64
Uterus capacity, cm^3	532.56^{B} ± 510.59	814.56^{A} ± 283.71
Right ovary weight, g	6.48 ± 2.46	5.71 ± 1.97
Left ovary weight, g	6.87 ± 2.62	6.90 ± 2.73
Number of born piglets	8.70^{B} ± 1.14	10.05^{A} ± 2.39

A, B – Highly significant $P \leq 0,01$

Table 2. Correlation coefficients between morphometric traits of reproductive system and litter size in primiparous sows mated at first estrus

Traits	Uterus with ligament	Vagina-cervix length	Right uterus horn length	Left uterus horn length	Uterus capacity	Right ovary weight	Left ovary weight	Number of born piglets
Uterus with ligament	1.000	0.2542	**0.5252^{xx}**	**0.5337^{xx}**	**0.5228^{xx}**	0.1745	**0.4799^{xx}**	0.2042
Vagina-cervix length		1.000	0.0357	0.0987	**0.4951^{xx}**	-0.0835	-0.0592	-0.3880
Right uterus horn length			1.000	**0.9004^{xx}**	0.1706	0.1500	0.2828	-0.0775
Left uterus horn length				1.000	0.2119	0.2928	0.3212	-0.0429
Uterus capacity					1.000	0.0685	0.1541	-0.0285
Right ovary weight						1.000	**0.4832^{xx}**	0.0939
Left ovary weight							1.000	**0.4879^{x}**
Number of born piglets								1.000

Correlation coefficients significant $P \leq 0,01^{xx}$; $P \leq 0,05^{x}$

Table 3. Correlation coefficients between morphometric traits of reproductive system and litter size in primiparous sows mated at second estrus

Traits	Uterus with ligament	Vagina-cervix length	Right uterus horn length	Left uterus horn length	Uterus capacity	Right ovary weight	Left ovary weight	Number of born piglets
Uterus with ligament	1.000	0.2722	**0.8418^{xx}**	**0.8396^{xx}**	**0.4855^{xx}**	**0.6508^{xx}**	**0.6937^{xx}**	0.0773
Vagina-cervix length		1.000	0.1896	0.2111	0.1988	0.1130	0.1123	**0.4044^{x}**
Right uterus horn length			1.000	**0.9319^{xx}**	**0.5370^{xx}**	**0.5278^{xx}**	**0.6269^{xx}**	0.1223
Left uterus horn length				1.000	**0.4561^{x}**	**0.6216^{xx}**	**0.5702^{xx}**	0.1005
Uterus capacity					1.000	**0.3834^{x}**	**0.5299^{xx}**	0.0877
Right ovary weight						1.000	**0.7799^{xx}**	0.0663
Left ovary weight							1.000	0.0604
Number of born piglets								1.000

Correlation coefficients significant $P \leq 0,01^{xx}$; $P \leq 0,05^{x}$

Conclusion

It has to be emphasised as a conclusion that with regard to the sows mated in the first estrus, the number of piglets in the litter was influenced by the weight of the left ovary and with regard to the mating of sows in the consecutive, second estrus, the most numerous litters were those born by the sows with the longest cervix.

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