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Impact of wean to standing reflex interval on litter size of sows (Short Communication)

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Abstract

Sow reproduction influences farm economy and can be considered as key factor of pig production efficiency. The aim of this study is to evaluate the effect of wean to standing reflex interval on the total number of piglets born and correlated number of piglets born alive and number of piglets weaned. Study was performed on crossbreed of Large White and Landrace sows originated from a commercial farm thus our results describe the real effect under commercial conditions. The results indicate that wean to standing reflex interval influence the litter size traits negatively if this interval is longer than 108 h. Highest differences was detected between 84 and 108 h of wean to standing reflex interval where decreasing about 2.8 total number of piglets weaned ($P \leq 0.01$) was found. Mutually only small effect of number of inseminations was detected.

Keywords: standing reflex, selection, litter size, sow

Introduction

The economically most important trait in pig production is litter size. Most important factors affecting litter size are as follows: Time of returning to oestrus after weaning. It is recognized that sows returning to oestrus 6 or more days after weaning have lower fertility than those returning 4 or 5 days after weaning. Parity numbers influence the litter size probably because partly different genes control reproductive traits in successive parities (Noguera *et al.* 2002). This indicates that different parities should be treated as different traits. Another factor concerning litter size is weaning to oestrus interval (Patterson *et al.* 2008), in our study weaning to standing reflex interval (W-SR). Also age at puberty (Sterning *et al.* 1998, Tummaruk *et al.* 2007), average daily gain (Tummaruk *et al.* 2009) number and type of insemination (Casas *et al.* 2010) year and season (Chen *et al.* 2010) affect the reproduction traits. Because our study is based on the data from commercial herd the effect of crossbreeding plays crucial role (Canario *et al.* 2006). Crossbreeding effect can be evaluated using information about the sow's parents and effect of board. Following this, it might be desirable to consider the period from weaning to standing reflex as easy observable and recognizable trait for selection of sows after first parturition. In present study the impact of weaning to standing reflex interval in combination with number of inseminations on total number of piglets born, number of piglets born alive and number of piglets weaned of sows originated from commercial herd were studied.

Material and methods

Experimental procedure

All sows were crossbreeds of Large White and Landrace originated from a commercial farm and they were bred in the same herd during the study. Sows were checked twice a day for the standing reflex by the back pressure test in presence of an adult boar. All sows included in the study were inseminated using 80 ml. The inseminations (always in the presence of mature boar) were performed twice a day either 12 or 24 h after standing reflex detection. All sows were checked for pregnancy by sonography test on the 30th day after insemination. The litter size was specified by the total number of piglets born (TNB; defined as the number of all fully formed foetuses expelled at farrowing, dead or alive), number of piglets born alive (NBA; defined as the number of piglets alive immediately after birth) and number of piglets weaned (NW; defined as the number of piglets available on the 28th day of the piglets' age).

Statistical analyses

Total number of 29 644 litters of 7 395 sows were used in computation. The information about the wean to standing reflex interval (W-SR), number of inseminations and standing reflexes to first insemination interval were known in case of 1 226 litters. The present study was conducted in the period between January 2008 and June 2010. The computation was performed using mixed linear model procedure REML in SAS for Windows 9.1.2. (SAS Institute Inc., Cary, NC, USA). The statistical model included the following fixed factors: wean to standing reflex interval (W-SR) in interaction with number of inseminations (NI), year of birth (YB), interaction between year and month of litter (YML), standing reflex to first insemination interval (SR-II), parity number (PN), age at puberty (AP) and average daily gain (ADG). The random effect of sires, dams and boars used for mating was taken into account as the source of genetic variation. The analyses of litter size traits were performed within second to sixth parity. Statistical model:

$$y_{ijklmnoprs} = \mu + W\text{-}SR \times NI_i + YB_j + YML_k + SR\text{-}II_l + PN_m + AP_n + ADG_o + Sire_p + Dam_r + Boar_s + e_{ijklmnoprs} \quad (1)$$

Results and discussion

Every study concerning litter size must consider that a complex of physiological, genetic and environmental factors and their interactions influence this trait. This complexity caused problematic breeding and even studying. Most important factors were mentioned in the introduction and all of them were incorporated into computation except for the type of mating since all sows were inseminated in our experiment.

The results presented in Table 1 show that litter size is well-proportioned without statistically significant differences when W-SR is between 84 and 108 h. Number of inseminations does not affect litter size either. It seems possible to eliminate insemination four times since three inseminations seem to be sufficient. These results correspond with the known fact that by pigs the litter size is conditioned by optimal fertility which is obtained by insemination in period of 24 h before ovulation (Soede *et al.* 1995). However, when the onset of standing reflex does not occur within 108 h, the differences are not negligible. Above

this period of time the litter size traits prove to be significantly lower. Although statistically significant difference between three and four inseminations in case of W-SR within 108 h was observed, its incidence was restricted only to this specific W-SR interval. Holm *et al.* 2005 in their study show that genetic variance for interval from weaning to first service, which correspond to W-SR, after first litter exist and selection for this trait is therefore possible. Nevertheless, the potential selection for W-SR is being complicated by low heritability found by Sterning *et al.* 1998 which found the heritability of weaning to oestrus interval which corresponds to SR is 0.24. The low heritability for the weaning to first service interval was found by Rydhmer (2000) which is furthermore decreasing for later parities (Hanenberg *et al.* 2001). The selection for W-SR can be potentially substitute by selection for age at first service since genetic correlation exist between these traits (Hanenberg *et al.* 2001).

In conclusion, the key factor for successful breeding is the number of piglets weaned or, more generally, the reproduction ability. In present study the impact of weaning to standing reflex interval and number of inseminations on litter size traits is computed. Presented results indicate that this interval influence the litter size traits negatively if longer than 108 h. Consequently the sows with longer weaning to standing reflex interval should not be preferred for another breeding. This can be useful since the ability to identify young females with superior reproduction would have a large economic impact on commercial swine production.

Table 1
Impact of weaning to standing reflex interval on litter size.

W-SR/NI	TNB	NBA	NW
84/3	13.0408 ± 0.4799^{Aa}	10.8331 ± 0.4144^{a}	9.9866 ± 0.2974
84/4	12.7052 ± 0.4445^{c}	10.8754 ± 0.3823^{c}	10.1961 ± 0.2790^{A}
96/3	12.5522 ± 0.7919	11.3222 ± 0.6934^{c}	10.3368 ± 0.4700^{a}
96/4	$12.0196\pm0.6808^{*}$	10.5739 ± 0.5947^{a}	10.0948 ± 0.4096^{a}
108/3	$13.5267\pm0.6855^{Ac**}$	11.4916 ± 0.5980^{Ac}	9.9563 ± 0.4117^{a}
108/4	10.9627 ± 0.8789^{Bd}	9.4393 ± 0.7700^{d}	$8.8748\pm0.5178^{Bb*}$
120/3	$12.1989\pm0.7363^{c**}$	$10.8721\pm1.5227^{*}$	$10.8330\pm1.0092^{**}$
132/3	$11.8995\pm0.8776^{*}$	$10.2390\pm0.7691^{*}$	$9.9765\pm0.5188^{*}$
132/4	12.8246 ± 2.3930	10.6363 ± 2.1150	10.2382 ± 1.3762
156/3	9.3940 ± 1.9145^{bd}	$7.0384\pm1.6877^{Bbd**}$	7.0035 ± 1.1128
168/3	10.8637 ± 2.9087	$10.\ 8271\pm1.8665$	9.9805 ± 3.2804

W-SR/NI: Wean to standing reflex interval and number of inseminations. First numbers are hours from wean to standing reflex and second numbers are number of inseminations, TNB: total number of piglets born, NBA: number of piglets born alive, NW: number of piglets weaned. $^{A,B}P\leq0.01$, $^{a,b;c,d}P\leq0.05$, $^{*,**}P\leq0.1$

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