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THE EFFECT OF PERFORMANCE AND LITTER PARITY ON FARROWING INTERVAL IN SOWS OF CZECH LARGE WHITE AND CZECH LANDRACE BREEDS

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Abstract

ČECHOVÁ, M., TVRDOŇ, Z.: *The effect of performance and litter parity on farrowing interval in Sows of Czech Large White and Czech landrace Breeds*. Acta univ. agric. et silvic. Mendel. Brun., 2006, LIV, No. 2, pp. 15–22

The dependence farrowing interval on litter parity, average daily gains, percentage of lean meat and backfat thickness was analysed in a set of 8 285 and 2 850 sows of Czech Large White and Czech Landrace breeds, respectively. The parameters under study were recorded in the Pig Breeders Association in Bohemia and Moravia. The highest farrowing interval (174.39 days) was found out in sows classified into the group with the lowest average daily gains (< 470 g). The farrowing interval slightly decreased with the increasing growth intensity. No explicit relationship between the farrowing interval and the intensity of growth was found out in sows of the CL breed. No dependence of farrowing interval of individual groups of sows on the percentage of lean meat was found out in sows of the CLW breed; however, there was a statistically significant ($P \leq 0.05$) difference between groups with lean meat shares of 54.1–55.9% and 58.0–59.9. With the exception of the group with the lowest share of lean meat (< 54%), the farrowing interval decreased in dependence on the LM % in sows of the CL breed. In sows of the CLW breed, there was a tendency to increasing farrowing interval with the increasing values of BT. The only exception was the group with BT below 8 mm in which the farrowing interval was 199 days. A similar trend was observed also in sows of the CL breed. The average farrowing interval decreased with the increasing parity rank in both breeds; in CLW sows this value decreased from 175.01 days (after the 1st parturiton) to 158.18 days (after the 7th and the following litters). A similar tendency (from 181.64 days after the 1st parturition to 161.64 days after the 7th and the following parturitions) was observed also in sows of the CL breed.

farrowing interval, sow, daily gain, lean meat, backfat

In sows, the farrowing interval is one of the basic criterions when evaluating their reproductive performance. This is a very important economic parameter because it shows a direct effect on the share of production costs per each litter as well as per each piglet produced during the life of the sow, i.e. from the first parturition to the culling. At present, the farrowing interval of 152 days is considered to be an optimum (Čeřovský,1992).

Fiedler et al. (1981) mentioned that with the increasing age of sows there was a tendency to the shortening of the farrowing interval from 187.70 days (between the 1st and the 2nd litter) to 173.57 (between the 8th and the 9th litter). Klusáček et al. (1973) mentioned that in their study this parameter ranged from 149.0 to 162.6 days. The effect of the farrowing interval on the level of reproductive parameters was studied also by (Tvrdoň et al.,1997; Bečková et al.,1991). These authors found out that the longest farrowing interval existed between the first and the second litter,

viz. 179.3 days and that thereafter it gradually decreased to 157.8 days. The average farrowing interval was 171.2 days. The highest numbers of newborn piglets were recorded on the 4th and the 8th parities (12.7 and 12.4, respectively). The lowest difference between the numbers of all-born and of weaned piglets was observed on the 3rd parity (0.9 piglets). Klusáček et al. (1987) referred that in gilts of Large White (LW) and Landrace (L) breeds with average daily gains (ADG) of 500–524 g and 525–549 g, the differences in the farrowing interval were statistically significant ($P \leq 0.01$). In sows of the LW breed, the variance was a little lower 171.19–174.39 days while in those of the L breed it was within the range of 173.65–178.21 days. Also other authors mentioned the neceesity to follow the relationship existing between the reproduction and changes in sow performance. For example O`Dowd et al. (1997) mentioned that in pigs selected for a higher percentage of lean meat (LM %) the decrease in the total amount of fat was associated also with some reproductive problems.

Gaughan et al. (1995), as well, followed reproductive parameters of gilts within a period of 15 years. They divided the animals into 3 groups according to the different thickness of backfat (9–13 mm, 14–16 mm and > 17 mm) and did not find any significant effect of backfat thickness (BT) on the number of litters, numbers of all and weaned piglets and on the weight of newborn piglets. However, in gilts with the lowest BT the number of litters, the weight of newborn piglets and the number of weaned piglets were lower than in other groups.

As mentioned by Rothschild & Ruvinski (1998), the effect of selection for a higher percentage of meat on the reproductive performance of sows could be observed only in later stages of their lives. The opinions concerning the effect of increasing LM % on the reproductive performance of sows are not fully consistent but Löbke et al. (1986), Kerr & Cameron (1994) and Kuhlers & Jungst (1992) mentioned that a one-sided selection for a high share of lean meat was associated with a certain decrease in fertility.

The aim of this study was objective to evaluate the influence farrowing interval on performance and litter parity.

MATERIAL AND METHODS

This analysis involved 8 285 and 2 850 sows of Czech Large White (CLW) and Czech landrace (L) breeds. Evaluated was the relationship between the length of parity on the one hand and performance parameters (average daily gains – ADG, backfat thickness – BT and percentage lean meat – LM %) on the other. Effects of farrowing interval and of litter rank on numbers of all and weaned piglets were analysed as well using data recorded in accordance with the Czech Standard ČSN 46 6164 in Stations of Performance Control of the Union of Pig Breeders in Bohemia and Moravia. Phenotypic values of performance parameters were measured under conditions of field tests using the apparatus Piglog 100. During the test period, all animals were fed *ad libitum* on a uniform feed mixture (TESTA). The test duration was 63 days and the age of tested animals was 12 weeks ± 4 days. Test groups consisted of 6–12 gilts per pen and the minimum floor area per animal was 0.8 m^2. In each pen, tested animals represented the progeny of at least two boars.

Basing on ADG, LM % and BT, sows were classified into 7; 5 and 6 groups, respectively. In individual test groups, basic statistical characteristics (i.e. mean and standard deviation) were calculated for all parameters under study and the differences were tested using Tukey test. Equations of linear regression between farrowing interval and numbers of all and weaned pigts were calculated for both breeds. This analysis was performed using the statistical program UNISTAT 4.53.

RESULTS AND DISCUSION

When selecting dam pig breeds, the trend to produce more lean meat is associated with a gradual decrease in backfat thickness. For this reason the recent research studies are focused on the evaluation of relationships existing between the performance parameters and reproduction traits. The objective of this study was to evaluate the relationships existing between the farrowing interval on the one hand and different phenotypic parameters of performance on the other. The average farrowing interval of sows of CLW and CL breeds with different intensity of growth (expressed as ADG recorded in performance tests) is presented in Tab. I. As one can see, the average farrowing interval was shorter in sows of the CLW breed.

In gilts of CLW breed, the maximum farrowing interval (174.39 days) was recorded in the group with the lowest ADG (< 470 g). This parameter slightly improved with the increasing intensity of growth. In gilts with the highest ADG, the length of parity was 171.72 days. The observed significant ($P \leq 0.05$) diferences between mean values of individual groups are also presented in Tab. I. Marková (2005) reported that in sows of CLW breed the average farrowing interval was 177.00 days and that the overal range was 142–328 days. No explict relationship between the farrowing interval and the intensity of growth was found out in sows of T breed. The highest farrowing interval (179.71 days) was recorded in the group with ADG 591–620 g while the shortest one was found out in the group with the lowest intensity of growth. For

the Czech Landrace breed, Marková (2005) mentioned the average farrowing interval 160.70 days with the range of 144.0–246.0 days. Klusáček et al. (1973) reported the range of 149.0 do 162.0 days.

I: *Dependence of the farrowing interval on average daily gains*

Parameter	Czech Large White		Czech landrace	
Range of ADG [g]	n	$\bar{x} \pm s_x$	n	$\bar{x} \pm s_x$
> 470	308	174.39 ± 31.94 [a]	153	173.65 ± 27.10 [c]
471–500	908	174.10 ± 33.52 [b]	285	176.62 ± 29.20
501–530	1 221	172.29 ± 29.52	426	174.23 ± 29.94
531–560	1 316	172.18 ± 29.05	443	175.80 ± 31.05
561–590	974	171.19 ± 27.72 [a,b]	284	178.21 ± 34.98 [c,d]
591–620	558	171.49 ± 27.88 [a,b]	210	179.71 ± 32.83 [c,d]
< 621	301	171.72 ± 34.20 [a,b]	124	173.80 ± 26.10 [d]

a, b, c, d: $P \leq 0.05$

Phenotypic levels of LM % and farrowing interval recorded in gilth of both breeds are presented in Tab. II. When comparing farrowing intervals in individual groups of gilts of both breeds it is obvious that in the CLW breed the values were lower. When evaluating the farrowing interval in individual groups no dependence on LM % was found out in gilts of CLW breed. However, in groups with lean meat shares of 54.1–55.9 and 58.0–59.9% the differences were statistically significant ($P \leq 0.05$). When neglecting the first group of CL gilts it is possible to observe that the farrowing interval decreased with the increasing LM %. The shortest farrowing interval (172.44 days) was found out in the group with 60.0 and more LM %; as compared with groups with 54.1–55.9 and 56.0–57.9 LM % the differences were statistically significant ($P \leq 0.05$).

The observed farrowing intervals corresponded with observations of other authors (Fiedler et al., 1981 and Tvrdoň et al., 1997). Marková (2005) as well published similar results and calculated a statistically highly significant negative correlation r = –0.4948 between LM % and farrowing interval for the Czech Landrace breed.

II: *Dependence farrowing interval on percentage of lean meat*

Parameter	Czech Large White		Czech landrace	
Range of LM [%]	n	$\bar{x} \pm s_x$	n	$\bar{x} \pm s_x$
< 54	301	172.86 ± 26.51	150	175.20 ± 32.86
54.1–55.9	667	174.11 ± 27.62 [a]	304	180.12 ± 35.25 [b]
56.0–57.9	1 680	172.47 ± 29.30	552	177.79 ± 35.45 [b]
58.0–59.9	2 105	170.78 ± 29.30 [a]	591	174.76 ± 25.75
> 60.0	833	173.69 ± 32.12	328	172.44 ± 25.15 [b]

a, b: $P \leq 0.05$

III: *Dependence farrowing interval on backfat thickness*

Parameter	Czech Large White		Czech landrace	
Range of BT [mm]	n	$\bar{x} \pm s_x$	n	$\bar{x} \pm s_x$
8.0 and less	239	199.00 ± 36.64 [a]	148	174.18 ± 29.50
8.1–10.0	1 322	172.05 ± 29.83 [a]	572	173.06 ± 24.09
10.1–12.0	2 437	171.42 ± 29.30 [a]	726	177.44 ± 31.87
12.1–14.0	1 219	172.93 ± 30.60 [a]	383	177.31 ± 34.48
14.1–16.0	300	173.97 ± 24.06 [a]	96	180.95 ± 42.10
16.1 and more	68	175.66 ± 27.09 [a]	-	-

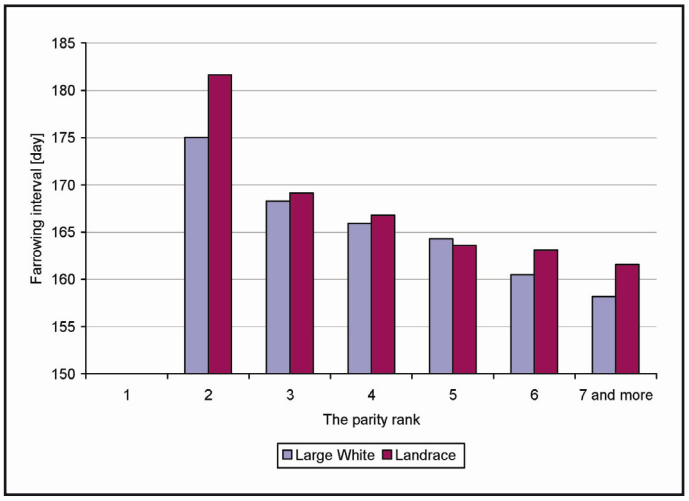
a: $P \leq 0.05$

BT is one of the most important selection criterions in both Czech and foreign programs. Average values of farrowing interval as recorded in individual groups with different BT are presented in Tab. III. With exception of the group with the lowest BT (< 8 mm), in which the farrowing interval was 199 days, the length of parity increased with the increasing values of BT. A similar trend was observed also in sows of CL breed. The difference between the farrowing interval of 199.00 days recorded in the group with BT below 8.0 mm and all other groups was statistically significant ($P \leq 0.05$). This observation corresponded with data published by Gaugham et al. (1995) who observed that sows with the lowest BT had also the lowest numbers of litters. The correlation between BT and the average length of parity in sows of the CL breed was not demonstrated.

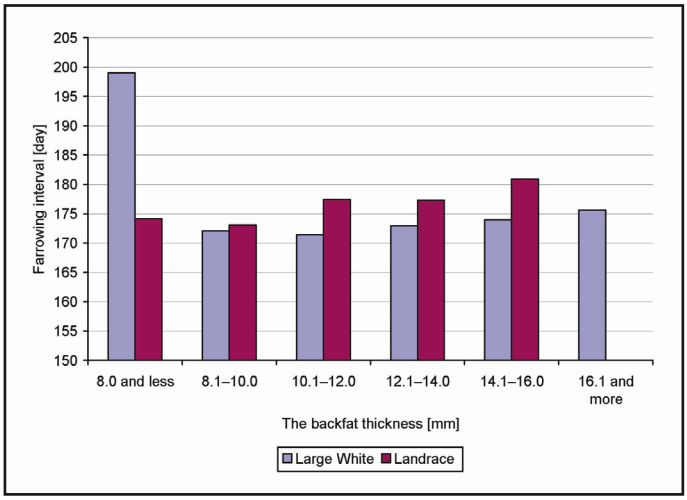
The results of statistical analysis of the dependence of farrowing interval on the litter rank in sows of CLW and CL breeds are presented in Tab. IV. In both breeds the average farrowing interval showed a decreasing tendency with the increasing rank of litters. In sows of CLW breed, the observed values decreased from 175.01 days (after the 1st litter) to 158.18 days (after the 7th and the following litters). Also in sows of the CL breed there was a tendency to the reduction of farrowing interval from 181.64 days after the 1st litter to 161.64 days after the 7th and following litters. These results corresponed with data published by Fiedler et al. (1981) and Čeřovský (1992). Tvrdoň et al. (1997), as well, found the highest farrowing interval between the 1st and the 2nd parturition (179.3 days). Thereafter, there was a gradual decrease to 157.8 days. These changes in the farrowing interval are illustrated in Fig. 1.– 4.

IV: *The dependence farrowing interval on the parity rank in sows of CLW and CL breeds*

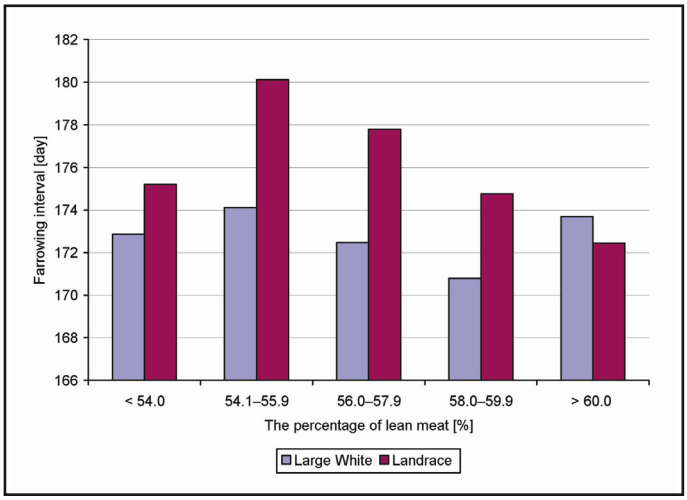
Parameter	Czech Large White		Czech landrace	
Parity	n	$\bar{x} \pm s_x$	n	$\bar{x} \pm s_x$
1	8 285	0.00	2 850	0.00
2	5 586	175.01 ± 37.96	1 925	181.64 ± 40.13
3	3 526	168.26 ± 29.64	1 160	169.12 ± 30.40
4	2 246	165.91 ± 27.26	708	166.80 ± 27.89
5	1 377	164.30 ± 24.52	421	163.60 ± 25.80
6	718	160.47 ± 20.09	218	163.12 ± 21.00
7 and more	322	158.18 ± 13.30	95	161.54 ± 22.85



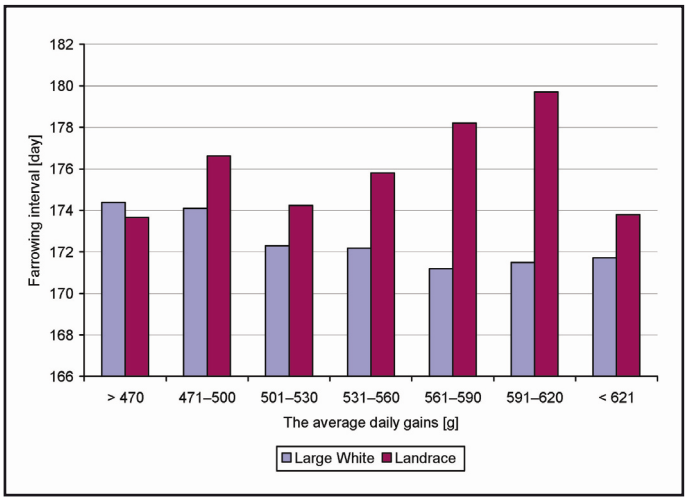
1: *Effect farrowing interval on the parity*



2: *Effect farrowing interval on backfat thickness*



3: *Effect farrowing interval on percentage of lean meat*



4: *Effect farrowing interval on the average daily gains*

SOUHRN

Délka mezidobí u prasnic plemene České bílé ušlechtilé a Česká landrase v závislosti na úrovni vlastní užitkovosti a pořadí vrhu

U 8 285 kusů prasnic plemene České bílé ušlechtilé a 2 850 kusů prasnic plemene Česká landrase byla vyhodnocena délka mezidobí v závislosti na pořadí vrhu, průměrném denním přírůstku, procentu libového masa a výšce hřbetního tuku, zjišťovaných ve vlastní užitkovosti. U prasnic plemene České bílé ušlechtilé zařazených do skupiny s nejnižším průměrným denním přírůstkem (470 g a méně) byla zjištěna nejdelší délka mezidobí – 174,39 dní. Se vzrůstající růstovou schopností docházelo k nepatrnému snižování délky mezidobí. Jednoznačný trend mezi délkou mezidobí a růstovou schopností nebyl u prasnic plemene Česká landrase zjištěn. Při hodnocení délky mezidobí mezi jednotlivými skupinami není u plemene BU patrný žádný trend v závislosti na % LM, i když mezi skupinami se zmasilostí 54,1–55,9 a 58,0–59,9 % LM byl zjištěn statisticky průkazný rozdíl ($P \leq 0,05$). U plemene Česká landrase, mimo skupinu s nejnižším procentem libového masa (do 54 %), docházelo se vzrůstající zmasilostí ke zkracování délky mezidobí. U plemene České bílé ušlechtilé mimo skupinu s nejnižší výškou hřbetního tuku, tj. do 8 mm, kdy byla zjištěna délka mezidobí 199 dní, je možné pozorovat určitý trend v prodlužování délky mezidobí se zvyšující se vrstvou podkožního tuku, Obdobně tomu bylo i u souboru prasnic plemene Česká landrase. U prasnic plemen České bílé ušlechtilé a Česká landrase průměrná délka mezidobí se zvyšujícím se pořadím vrhu měla sestupnou tendenci. V souboru prasnic plemene České bílé ušlechtilé klesala od hodnoty 175,01 dne v 1. vrhu na hodnotu 158,18 dne v 7. a dalším vrhu. Také u plemene Česká landrase bylo zjištěno zkracování délky mezidobí z 181,64 dne v 1. vrhu na 161,64 dne v 7. a dalších vrzích.

mezidobí, prasnice, denní přírůstek, zmasilost, hřbetní tuk

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