

EFFECT OF LITTER SIZE ON PIGLET LOSSES IN DIFFERENT SOW PARITIES*Weisbauerová E.¹, Rozkot M.¹, Nevřkla P.², Hadaš Z.²*¹ *Institute of Animal Science Prague, Czech Republic*² *Mendel University in Brno, Czech Republic***Abstract**

The objective of the study was to determine the effect of parity on sow reproduction traits and the effect of litter size on piglet losses from the birth to weaning. Sows from two herds (N=301) was monitored during their four parities. The number of total born, born alive, stillborn, weaned piglets were monitored and percentage of piglet losses was calculated from obtained data. The lowest number of total born piglets was found in parity 1 (15.92 ± 3.38), the highest number of total born piglets was found in parity 4 (23.67 ± 3.13). There were also found statistically significant differences ($P < 0.001$) in other reproduction traits among parities. The effect of litter size (total born piglets) on piglet losses was monitored in individual parities. It can be concluded that with increasing the litter size, the piglet losses are higher in all parities ($P < 0.001$).

Key Words: Piglet; litter size; reproduction; piglet losses

Litter size at birth has increased in last years. But litter size at birth is negatively related to the survival of the piglets (Grandinson et al., 2003). The survival rate has a very low heritability. Piglet mortality is a problem connected with economic losses in pig production. Piglet mortality can be decreased in various ways-intervention concerning on housing systems, care of new born piglets, human-animal interaction (Stygar et al., 2022). Piglets dying before or during farrowing, as well as before weaning, can result in loss of economic profit. Piglet losses can be caused by chilling, starvation, injury, low birth weight or disease (Baxter and Edwards, 2018). According Koketsu et al. (2021), one of five piglets will typically be stillborn or die within the first few days of life. Piglets die from a wide variety of causes which are induces by the three-way interactions between the piglets, the sow and the environment.

Some studies show that preweaning mortality of

piglets is associated with more piglets born alive (Koketsu et al., 2021). Dufrasne et al. (2013) mention that more stillborn piglets is associated with higher preweaning mortality of piglets. According Koketsu et al. (2021) sows at the first parity have higher preweaning piglet mortality than sows at the fifth parity or higher in late phase of lactation. It could be caused by lower colostrum production by sows. In contrast, high parity sows have higher preweaning piglet mortality in the first phase of lactation. It is connected with higher number piglets born with low vitality. Also, these sows have a long farrowing duration.

Hellbrugge et al. (2008) found that 31.3% of all piglet losses occurred during the first day of their life and 68% losses during the first 3 days and 82% during the first week. Parity number had a significant influence on piglet losses, the survival rate decreased with increasing parity of the sow. There were the lowest piglet losses in parity two.

Material and Methods

The objective of the study was to determine the effect of parity on sow reproduction traits and the effect of litter size on piglet losses from the birth to weaning. Sows from two herds (N=301) was monitored during their four parities. The number of total born, born alive, stillborn, weaned piglets were monitored and percentage of piglet losses was calculated from obtained data.

The analysis of variance was used for statistical analysis in QCExpert software. The data were divided in four groups according the number of total born piglets based on average and standard deviation in individual parities.

Results and Discussion

The comparison of reproduction traits in parities 1-4 is illustrated in Table 1. There were statistically significant differences ($P < 0.05 - 0.001$) among parities. The lowest reproduction parameters were found in parity 1, the number of total born piglets was 15.92 ± 3.38 , number of piglets born alive 14.23 ± 3.10 , number of weaned piglets 12.05 ± 2.54 . Number of stillborn piglets in parity 1 was 1.70 ± 1.67 . The percentage of piglet losses was at level 14.35 %. Compared to that, the highest reproduction traits were found in sows - parity 4.

The effect of litter size (number of total born piglets) on reproduction parameters and piglet losses is illustrated in Table 2-5. Litter size is associated with higher piglet mortality. The piglet losses are increasing with the litter size in every parity in our study. The highest percentage of piglet mortality was found in parity 1 (18.58%). Persdotter (2010) reports piglet mortality at the level of 14-20%. Most cases of piglet death are recorded in the first two days after birth. Hines and Loucks (2020) report that the number of total and alive born piglets and the number of weaned piglets are closely interdependent traits. As the litter size increases, the number of piglets born alive and weaned increases. However, at the same time as the

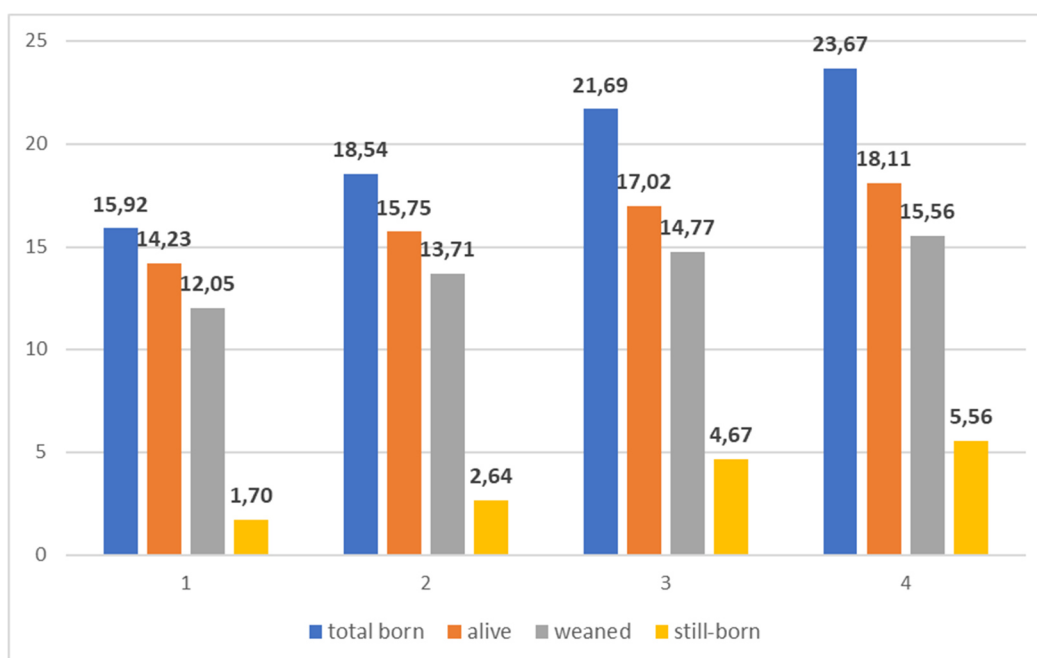
number of piglets in the litter increases, the losses of piglets also increase. The number of stillborn piglets increases with litter size (KLIMAS et al., 2020). Peltoniemi et al. (2021) report that the larger the litter of piglets, the longer the birth takes. As farrowing progresses, there is an increased risk that 20-30% of piglets will not have access to full quality colostrum as the amount of immunoglobulins in the colostrum decreases from the start of farrowing. These piglets also have less time to receive colostrum. The risk of a higher number of stillborn piglets is higher in sows in the first parity and in sows in the fifth and subsequent parity (CANARIO et al., 2006). The total mortality of piglets, including stillborn piglets, is 13-15% in large litters. Some litters in which more than 19 piglets are born can reach up to 18% mortality already within the first day after birth (YUN et al., 2019).

Robinson and Quinton (2002) analysed the genetic correlation between piglet born and piglet mortality. They found genetic correlation of $r=0.5$ between these traits. Also Hellbrugge et al. (2008) calculated genetic correlations between survival rate of piglets and number of piglets born alive, stillborn piglets, number of total born piglets. They found negative genetic correlations between mentioned traits. In our study, the correlation between number of total born piglets and piglet losses was calculated at the level 0.414 (parity 1), 0.466 (parity 2), 0.514 (parity 3) and 0.407 (parity 4) ($P < 0.001$). Persdotter (2010) reports that with the number of all piglets born/litter, the number of stillborn piglets/litter increases. The author also mentions a significant positive correlation between the number of all piglets born/litter and the number of stillborn piglets. This means that the larger the litter, the higher the number of stillborn piglets. In our study, a significant ($P < 0.001$) positive correlation was found between the number of all piglets born and the number of stillborn piglets (0.419; 0.688; 0.785 and 0.790 in parity 1-parity 4).

Table 1. Effect of parity on sow reproduction traits

	Parity			
	1	2	3	4
	N = 301	N = 232	N = 161	N = 94
Piglets born total/ litter	15.92 ± 3.38 ^{ABC}	18.54 ± 4.72 ^{Aa}	21.69 ± 4.81 ^B	23.67 ± 3.13 ^{aC}
Piglets born alive/ litter	14.23 ± 3.10 ^{aA}	15.75 ± 3.25 ^b	17.02 ± 3.01 ^a	18.11 ± 2.35 ^{Ab}
Piglets weaned/litter	12.05 ± 2.54 ^{ab}	13.71 ± 2.57	14.77 ± 2.24 ^b	15.56 ± 1.66 ^a
Piglets still-born/ litter	1,70 ± 1.67 ^{ABC}	2.64 ± 2.30 ^{aAD}	4.67 ± 3.30 ^{aB}	5.56 ± 3.18 ^{CD}
Piglet losses (pcs)	2.17 ± 1.87 ^{abc}	2.04 ± 1.40 ^{aAB}	2.25 ± 1.26 ^{Ab}	2.55 ± 7 1.09 ^{BC}
Piglet losses (%)	14.35	12.27	12.67	13.69

a,b,c - P<0.05 A,B,C - P<0.001

Figure 1. Effect of parity on number of born, stillborn and weaned piglets**Table 2.** Effect of litter size on reproduction traits and piglet losses – parity 1

	Number of total born piglets/litter			
	> 12	13 - 16	17 - 20	21 <
	N = 65	N = 99	N = 105	N = 31
Piglets born alive/ litter	10.00 ± 1.51 ^{AB}	13.56 ± 1.48 ^C	16.28 ± 1.55 ^A	18.29 ± 2.22 ^{BC}
Piglets weaned/litter	8.92 ± 1.72 ^{AB}	11.57 ± 1.29 ^C	13.66 ± 1.84 ^A	17.74 ± 1.69 ^{BC}
Piglet still-born/ litter	1.46 ± 1.34 ^a	0.93 ± 1.18 ^{ba}	2.02 ± 1.59 ^b	3.55 ± 2.16 ^{aA}
Piglet losses (pcs)	1.08 ± 7 1.25 ^{aA}	1.99 ± 7 1.47 ^b	2.62 ± 1.97 ^a	3.55 ± 2.41 ^{Ab}
Piglet losses (%)	10.56	14.11	15.68	18.58

a,b,c - P<0.05 A,B,C - P<0.001

Table 3. Effect of litter size on reproduction traits and piglet losses – parity 2

	Number of total born piglets/litter			
	> 14	15 - 18	19 - 22	23 <
	N = 46	N = 69	N = 67	N = 48
Piglets born alive/litter	11.17 ± 2.00 ^{ABC}	15.13 ± 1.41 ^{AD}	17.13 ± 1.92 ^B	19.19 ± 1.89 ^{CD}
Piglets weaned/litter	10.07 ± 1.70 ^{aAB}	13.19 ± 1.44 ^{aC}	15.16 ± 1.40 ^A	16.00 ± 1.29 ^{BC}
Piglet still-born/litter	0.96 ± 1.21 ^{AB}	1.45 ± 1.19 ^{aC}	3.30 ± 1.69 ^{Aab}	5.10 ± 2.59 ^{BCb}
Piglet losses (pcs)	1.11 ± 0.90 ^A	1.94 ± 1.26 ^B	1.97 ± 1.38	3.19 ± 1.25 ^A
Piglet losses (%)	9.44	12.60	11.04	16.27

a,b,c - P<0.05 A,B,C - P<0.001

Table 4. Effect of litter size on reproduction traits and piglet losses – parity 3

	Number of total born piglets/litter			
	> 16	17 - 21	22 - 26	27 <
	N = 27	N = 39	N = 67	N = 27
Piglets born alive/litter	12.67 ± 2.15 ^{ABC}	16.54 ± 1.93 ^A	18.30 ± 2.05 ^B	18.89 ± 2.62 ^C
Piglets weaned/litter	11.56 ± 2.10 ^{aAB}	14.59 ± 1.43 ^a	15.69 ± 1.51 ^A	15.96 ± 1.79 ^B
Piglet still-born/litter	1.07 ± 1.33 ^{AB}	2.67 ± 1.74 ^{aC}	5.45 ± 2.16 ^{Aab}	9.22 ± 2.50 ^{BCb}
Piglet losses (pcs)	1.11 ± 1.12 ^{ab}	1.95 ± 1.10	2.61 ± 1.10 ^a	2.93 ± 1.17 ^b
Piglet losses (%)	8.59	11.42	13.97	15.04

a,b,c - P<0.05 A,B,C - P<0.001

Table 5. Effect of litter size on reproduction traits and piglet losses – parity 4

	Number of total born piglets/litter			
	> 19	20 - 23	24 - 27	28 <
	N = 12	N = 31	N = 33	N = 17
Piglets born alive/litter	15.33 ± 1.15 ^{aA}	17.58 ± 1.78 ^b	18.64 ± 1.64 ^a	20.00 ± 2.98 ^{Ab}
Piglets weaned/litter	14.00 ± 0.74 ^a	15.06 ± 1.12 ^b	15.82 ± 1.33	17.06 ± 2.19 ^{ab}
Piglet still-born/litter	1.92 ± 1.38 ^{aAB}	4.03 ± 1.92 ^{aCb}	6.45 ± 2.00 ^A	9.18 ± 3.47 ^{BCb}
Piglet losses (pcs)	1.33 ± 0.89 ^{ab}	2.52 ± 1.09	2.82 ± 0.77 ^a	2.94 ± 1.20 ^b
Piglet losses (%)	8.43	13.96	15.02	14.34

a,b,c - P<0.05 A,B,C - P<0.001

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