REPOPULATION METHOD FOR IMPROVMENT OF REPRODUCTIVE PERFORMANCE OF SOWS

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Abstract

The experiment was designed to evaluate differences in reproductive performance parametres in sows of selected utilitarian breeds before and after repopulation. The experimental population consisted of 160 sows, while the group before repopulation counted 80 sows from 1st to 5th litter. The repopulated (newly brought) group counted 80 gilts at the 1st litter. The values of the total number of piglets per litter were 12.21 ± 2.63 before repopulation against 15.96 ± 2.20 after repopulation. The nember of live -born piglets was 11.25 ± 2.43 before repopulation and 14.63 ± 2.09 after repopulation. Before repopulation 0,96 ± 0,99 of piglets were stillborn and after repopulation the number was 1.30 ± 1.36. The values of number of reared piglets were 9.69 ± 1.75 in the group before repopulation against 13.44 ± 1.79 in the group after repopulation. The differences in the total number of piglets, the number of live-born piglets and teh number of reared piglets were highly statistically significant ($P < 0.001$). The results of the experiment confirmed the positive effect of repopulation on reproductive performance parametres of sows.

Key Words: Repopulation, reproduction, sow, piglet

Cost-effective production of pigs is influenced mainly by the fertility of sows. Within the optimization of pig breeding it is important to focus on the number of live-born and reared piglets per sow. These number were always considered crucial indicators of farm success. It is constantly pointed out, that the number of reared piglets per sow is the cause of problems in our farms and it is also the most different parameter between our and successful foreign farms (Rozkot, 2012). Optimal reproductive management is besides various endogenous and exogenous factors influenced by the health condition, which is then reflected in rearing and fattening of pigs and therefore in whole profitability of farm (Lambert *et al*., 2012). Bad health situation in farms can be solved by the system of radical repopulation method.

According to Pelikán (1989) this method comes originally from the USA from the year 1952 and it continuously started to apply in conditions of the Czech Republic. Plhal (1987) states that the environment, nutrition, gene pool and health as conditions of high performance must be systematically checked and it is necessary to renew them in time periods and preferably by radical recovery by the method of repopulation. The method consists of extracting piglets shortly before birth either by Caesarian operation or by extraction of all whole uterus (hysterectomy) or by aseptic capture of piglets. According to Koliander *et al.* (1989), the disease life cycle can be interrupted this way as there is no contact between piglets and sow. This method is known as specific pathogen free (SPF). The method is economically more demanding than conventional rearing piglets by a sow. Therefore it is recommended for production of pigs in breeding or reproductive farms. In production farms sows give birth naturally (Černý, 1989; Schwarzer *et al.*, 1986). It is necessary to follow the rules of biosecurity to prevent reinfection in a repopulated farm (Drábek, 2001). The merit of SPF herds is that they allow preservation of genetically valuable material of original herd. The higher expenses on special breeding techniques return in two years after repopulation at the latest and under appropriate breeding and hygienic conditions the high health standard of SPF herd should maintain for over five years (Černý, 1989).

This way the herds are recovered from various agents and particularly from the reproductive and respiratory syndrom (PRRS), which has negative effect on both fertility and viability of piglets. The incidence of PRRS in the Czech Republic is nowadays endemic in many farms (Pulkrábek *et al*., 2005). Permanent incidence of PRRS means mainly great economical problem for farmers, which is cummulated by direct losses during short-term acute flares of the disease but also as a result of prolonged low yield. The success of recovery and elimination f PRRS is considerably influenced by the system and organization of the farm and the possibilities for farmers to implement the conditions of external and internal protection of individual farms from the introduction of infection. It can be predicted that in highly productive animals free from most infectious diseases the economical profitability will be higher in terms of better performance of sows and other pig categories (Roehe and Kalm, 2000).

Material and Methods

The aim of this observation was evaluation of the differences in productive performance in selected reproductive parametres in a herd of sows before and after repopulation in a selected farm.

The observation was carried out in a productive sows farm, where 160 sows were included in the experiment. Before repopulation, 80 sows from 1st to 5th litter were evaluated. Repopulated (newly stocked) group consisted of 80 gilts at the 1st litter. Animals of both groups were of the same hybrid combination.

Newly delivered SPF gilts were placed into decontaminated stable with strict batch, black and white breeding system with stringent hygienic provisions:

- Stable entry was via one main entrance with mandatory showering, clothing and footwear exchange for all nursing staff and visitors.
- Each building entrance was equipped with disinfection mat for desinfection and cleaning of footwear.

- A strict control of persons and visitors movement in the area of the farm was applied and the entrance of those who came into contact with other pigs within last three days or who breed pigs at home was prohibited.
- Gilts were brought from proved source farm applying the same strict measures as the observed farm.
- The group of newly brought breeding gilts were first acclimated and then stabled in quarantine.
- Vehicles were properly cleaned and disinfected before entering the farm, drivers were not allowed to move either in the area of the farm or in the stables.
- Vectors such as insect and rodents, which are considered to carry viral infections must be regularly eliminated by the means of desinfection and deratization.

Folloving provisions were made inside the stables :

- Movement of piglets among litters was disabled, except for the first 24 hours after birth if necessary.
- Injection needles and other utilities were used only for one litter.
- Windows of stables for both served and pregnant sows were equipped with nets against birds and insect.
- Thorough cleansing and desinfection of stables is performed after batch emptying of each section.

In the category of mated sows, both groups of sows were stabled individually for the time of one month and subsequently the pregnant sows were moved to group pens with groups of 6 to 8 animals till the time of 5 days before farrowing on average. In the category of sows shortly before farrowing, farrowing and lactating sows they were stabled in individual farrowing pens with whole-slatted floors. In categories mentioned above the administration of feed was carried out automatically. Air exchange, both in the farrrowing house and in the spaces for mated and pregnant sows, was also carried out automatically. Optimal microclimate for piglets was ensured by using heated pads. From the 7^{th} day after birth th epiglets were served with supplementary feed. The piglets were weaned at the average age of 28 days. In both groups of sows (before and after repopulation) the phenotypic level of following selected reproductive parameters were observed: total number of born piglets, number of live-born piglets, number of stillborn piglets, number of reared piglets.

Reproductive values gained from repopulated herd were compared to the values gained from sows before repopulation. Basic statistical characteristics of evaluated parametres were assessed, namely the mean, the standard deviation and statistical conclusiveness between the groups of sows, where *** stands for $P < 0.001$, ** for $P < 0.01$, * for $P < 0.05$ and – stands for $P > 0.05$. Programs STATISTICA version 9.0 and Microsoft Excel 2010 were used for statistical evaluation. Data were evaluated with the use of t-test.

Results and Discussion

Table 1 shows the total nubers of piglets per litter. Before repopulation, the total number of piglets was 12.21 ± 2.63. After the repopulation, higher total number of piglets was recorded (15.96 ± 2.20). Statistical evaluation confirmed high statistical significance of the difference between the two groups of sows ($P < 0,001$). Arango *et al*. (2006), in their work dedicated to optimization of piglets breeding, report the total number of piglets per litter of 11.8, which is lower value, than that reached in both broups of sows in our experiment. Higher values were proved by Vanderhaege et al. (2011), who reported 13.8 as a total number of piglets for hybrid sows in evaluation of farrowing of sows.

Nguyen *et al.* (2011) state that the litter size at birth is influenced by many factors. By examination of performance of five hundred hybrid sows he found 12.3 piglets born per litter and notes that first litter sows have less numerous litters than older sows. Wolf *et al.* (2008), the aim of the present genotypes of sows is to give birth to the highest possible number of viable piglets. His experiment showed 13.70 piglets born per litter. Damgaard *et al.* (2003) point out that litter size affects survival of piglets after birth. The results of the total number of piglets shown in table 1 before repopulation can be considered comparable to common utilitarian farms. After the repopulation, the result in the evaluated parameter is excellent.

Table 2 records the numbers of live-born piglets per litter. Before repopulation the number of live-born piglets was 11.25 ± 2.43 while after repopulation, the number was higher (14.63 ± 2.09). By the statistical analysis, highly statistically significant ($P < 0.001$) difference was proven between the groups of sows in the number of live-born piglets.

According to Rozkot (2012) the number of live-born piglets can be considered a very important aspect of reproduction. Kilbride *et al*. (2012) reported 11 live-born pigltes per litter in common health situation. This number was recorded before repopulation. Improvement of health status of sows with the influence on reproduction is documented also by Olanratmanee *et al*. (2010), who found 10.30 live-born piglets per litter for sows with health problems, against 11.10 live born piglets for sows without health problems. These findings suggest that induction of SPF herds improves numbers of live-born piglets. The number of live-born piglets (14.63) in the group of repopulated sows indicates good health status of sows.

Tab. 1 Basic statistical characteristics of the total number of piglets per litter

Parameter	n litters	$\bar{x}$	s_x	X_{min}	X_{max}	Conclusiveness
Before repopulation (pcs)	80	12.21	2.63	4	19	***
After repopulation (pcs)	80	15.96	2.20	11	20	
Total	160	-	-	-	-	-

*** ($P < 0,001$)

Tab. 2 Basic statistical characteristics of the number of live-born piglets per litter

Parameter	n litters	$\bar{x}$	s_x	X_{min}	X_{max}	Conclusiveness
Before repopulation (pcs)	80	11.25	2.43	4	18	***
After repopulation (pcs)	80	14.63	2.09	11	19	
Total	160	-	-	-	-	-

*** (P < 0,001)

Data in table 3 represent the numbers of stillborn piglets per litter. Before repopulation, 0.96 ± 0.99 piglets were stillborn per litter. After repopulation, slightly higher number of stillborn piglets was recorded (1.30 ± 1.36). The statistical evaluation revealed no statistical significance of the difference in the number of stillborn piglets per litter between the two groups.

Nielsen *et al*. (2002) recorded 2 to 6 stillborn piglets per litter in sows with problematic health. However, the number of stillborn piglets is determined very importantly by the size and number of litter. vrhu (Borges *et al*., 2005; Canario *et al*., 2006; Lucia *et al*., 2002). Lewis *et al*. (2009) state that PRRS positive sows or gilts have higher incidence of stillborn piglets and note that also the order of litter plays an important role in this aspect because of immunity state of the sows. Older sows are imunologically more competent than younger sows. Nielsen *et al*. (2002) reported 2 to 6 stillborn piglets per litter from sows with health problems. Lewis *et al*. (2009) found 3.00 stillborn piglets from ill gilts and 0.60 stillborn piglets from healthy sows per litter and their observation highlights that gilts have higher incidence of stillborn piglets. Schneider *et al*. (2011) points out that the number of stillborn piglets is determinated by size of the litter, which also influences parturition lenght. Longer parturition means higher number of stillborn piglets. The results in table 3 show slightly higher number of stillborn piglets after repopulation. This fact is caused by more numerous litters of sows at the first litter.

Table 4 reports the numbers of reared piglets per litter. Before repopulation, 9.69 ± 1.75 piglets per litter were reared. After repopulation the number of reared piglets per litter increased (13.44 ± 1.79). After statistical evaluation, very highly significant difference (P < 0.001) was proven between the groups of sows in the number of reared piglets.

The number of reared piglets per sow is considered the most important economic effect of breeding of sows (Arango *et al*., 2006). Mauch et Bilkei (2004) report 9.21 ± 1.02 reared piglets in the evaluation of health status of sows in relation to reproduction of ill animals, which corresponds to the data gained by evaluation of the group before repopulation, and 10.11 ± 0.37 of reared piglets per healthy sow, which is a value more than three piglets lower than the value found in the group after repopulation. Lewis *et al*. (2009) reported 7.50 reared piglets per litter from sow with health problems against 9.25 reared piglets per litter from healthy sows. Wolf *et al*. (2008) document in their work, that the quantity of reared piglets should exceed number 11. Schwarzer *et al*. (1986) say that the number of reared piglets increases after repopulation and in suitable breeding conditions the effect will be maintained for five years, which they consider economically advantageous. The results of the number of reared piglets found after repopulation can be considered excellent for the sows at the 1st litter and prove the benefits of repopulation.

Tab. 3 Basic statistical characteristics of the number of stillborn piglets per litter

Parameter	n litters	$\bar{x}$	s_x	X_{min}	X_{max}	Conclusiveness
Before repopulation (pcs)	80	0.96	0.99	0	4	NS
After repopulation (pcs)	80	1.30	1.36	0	5	
Total	160	-	-	-	-	-

NS (P > 0,05)

Tab. 4 Basic statistical characteristics of the number of reared piglets per litter

Parameter	n litters	$\bar{x}$	s_x	X_{min}	X_{max}	Conclusiveness
Before repopulation (pcs)	80	9.68	1.75	4	12	***
After repopulation (pcs)	80	13.44	1.79	10	18	
Total	160	-	-	-	-	-

*** (P < 0,001)

Conclusion

The experiment proved the positive effect of repopulation on reproductive performance of sows. After radical repopulation of a herd, important parametres of reproduction, which determine the economy of pig breeding, are increased. The values found in the experiment after repopulation, mainly the number of live-born piglets (14.63) and reared piglets (13.44) per litter can be assessed as very competitive and comparable to top foreign farms. Repopulation can be considered as a method of health situation and reproductive performance improvement in Czech pig breeding.

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