THE INFLUENCE OF PIGLET BIRTH WEIGHT ON GROWTH PERFORMANCE

Václavková E., Daněk P., Rozkot M.

Institute of Animal Science Prague, Czech Republic

Abstract

The aim of the study was to estimate the effect of piglet birth weight on future growth intensity of pigs. Piglets (n=80) were weighted after birth, at age of 21 days, 28 days, 38 days, 4 weeks before slaughter, 2 weeks before slaughter and at the day of slaughter. For purpose of the study pigs were divided in four groups according their birth weight (less than 1000 g, 1001-1200 g, 1201-1500 g, 1501 g and more) and average daily gain in particular periods was calculated. Low birth weight was associated with decreased survival and lower postnatal growth rates. The pigs with low birth weight grew slower than pigs with higher live weight at birth. The lowest daily gains were found in pigs with the lowest birth weight during their growing and finishing period ($P<0.01$-0.001). They achieved the average daily gain from birth to slaughter of 546.04 ± 35.44 g in comparison to pigs with the heaviest birth weight (732.04 ± 40.19 g). Pigs with birth weight 1201-1500 g reached the slaughter weight 14 days earlier than lighter pigs. This finding is important from economic point of view.

Key Words: Pig, birth weight, growth, daily gain

Selection for sow ability to give birth to a higher number of piglets has led to an increased within-litter variation in piglet birth weight. A critical birth weight of 950 g has been proposed, below which the development of myofibers and lipids may be modified. Birth weight is an important trait in pig production (Ouiniou et al., 2002). Low birth weight results from intrauterine growth retardation during gestation. Small piglets form a lower total number of skeletal muscle fibres during prenatal development compared with their larger littermates (Gondret et al., 2006). The results of a study by Quiniou et al. (2002) demonstrated that the average piglet body weight may decrease and the percentage of piglets with low birth weight may increase with increasing litter size. These findings have been associated with the effect known as intrauterine crowding, which, together with genetic and epigenetic factors, influences angiogenesis, growth, and vascularization of the placenta. Consequently, nutrient and oxygen supply of the fetuses and, ultimately, their growth and development are affected (Town et al., 2004; Wu et al., 2006). Père and Etienne (2000) reported that when litter size increases, the uterine blood flow increases, but to a lower extent than the number of the fetuses. This results in reduced uterine blood flow per fetus, which then might affect fetal nutrient supply.

The birth weight of piglet is 1 % from its slaughter weight. The piglets with birth weight higher than 1.2 kg are considered to be viable and reach the maximum of its production efficiency (Herčík, 2003).

Pre-weaning mortality is a major cause of wastage in pig production. Birth weight variation within litters affects piglet survival and weight gain. Parity and litter size are some of the factors affecting birth weight. Milligan et al. (2002) indicated that parity influences birth weight and generally, sows in first parity have lower birth weight yields than sows in other parities. There is a negative correlation between litter size and birth weight, hence increase in litter size yields reduced birth weight (Damgaard et al., 2003). In pig production, weaning number and weaning weight are important parameters. Birth weight and litter size affect weaned numbers and weight. Birth weight is positively correlated with weaning weight, but is negatively correlated with the weaning weight. In addition, with high birth weights there is high weaning number tendency (Quiniou et al., 2002; Gondret et al., 2005). There is an inverse relationship between birth weight and piglet mortality and the pre-weaning mortality rate is high in piglets with low birth weight (Damgaard et al., 2003; Mesa et al., 2006). Marcatti (1986) indicated a high mortality rate of 60% for piglets born under 800 g.

Material and Methods

The objective of this study was to estimate the effect of piglet birth weight on future growth intensity of fatteners. Eighty piglets were divided into four groups according their birth weight (less than 1000 g, 1001-1200 g, 1201-1500 g, 1501 g and more). Pigs were weighed and individually identified within 24 h of birth. Live weight of animals was measured at age of 21 days, at weaning (28 days), at 38 days, 4 weeks before slaughter, 2 weeks before slaughter and at the day of slaughter. Pigs were fed standard commercial feed mixtures for appropriate weight categories. The average daily weight gain was calculated. Standard statistical parameters were calculated using QCExpert program (TriloByte Statistical Software, s.r.o. Pardubice, Czech Republic).

Results and Discussion

The effect of birth weight of piglets on economically important traits was evaluated in this study. The results from our measurement of live weight in different live stages of pigs are illustrated in Table 1and Figure 1.The pigs with low birth weight grew slower than pigs with higher live weight at birth. The differences in live weight among groups are statistically significant at all stages of age. Pigs with birth weight less than 1000 g achieved the lowest weight gain from the birth to the weaning (241.67 ± 26.30 g) and also from the birth to the slaughter (546.04 ± 35.44 g). The highest average daily weight gain (309.52 ± 39.86 g, resp. 732.04 ± 40.19 g) was found in pigs with birth weight higher than 1500 g.

The data presented in our study are consistent with previous studies showing that light pigs at birth required a greater number of days to reach the same slaughter weight than their heavier littermates (Wolter et al., 2002). In our study, the average difference between pigs with the lowest (less than 1000 g) and the highest (more than 1500 g) birth weight was 30 kg at the end of the experiment. Gondret et al. (2005) studied the influence of piglet birth weight on postnatal growth performance. They found the differences between piglets with light birth weight (0.8-1.1 kg) and heavy birth weight (1.75-2.05 kg) in growth intensity. Average daily gain in smaller piglets was reduced by 31 % during suckling period. But the growth performance during the growing-finishing period was similar in both groups. Overall average daily gain from birth to slaughter was 8 % lower and this resulted in a 12-day increase in the age at slaughter for the pigs with light birth weight.

Rehfeld and Kuhn (2006) showed that piglets with lower body weight at birth grow slower and are fatter at slaughter. They assumed that, due to lower myofiber hyperplasia, more rapid hypertrophy occurs in pigs with low birth weight, and the plateau of myofiber growth is attained earlier than in pigs with higher birth weight. Consequently, dietary energy is available earlier for extensive fat deposition. Moreover, lighter pigs were found susceptible to impaired meat quality as expressed in greater drip loss and lower tenderness scores than their heavier siblings.

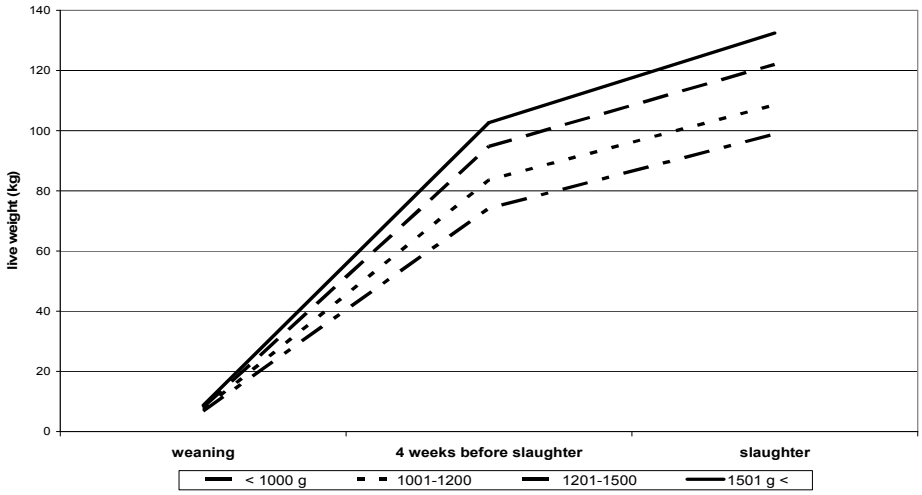
Bérard et al. (2008) also studied the effect of birth weight on growth, carcass and pork quality. They found that average daily gain of piglets with different birth weight was similar in the preweaning period. This finding is in contrast with results reported by Quiniou et al. (2002) showing that during lactation heavier piglets grow faster than lighter piglets. These authors assumed that heavier piglets have a greater ability to occupy the best-performing teats, to stimulate and to drain them, thereby, to induce a larger milk flow.

Table 1. Effect of birth weight on growth intensity of pigs

Trait	Birth weight			
	< 1000 g	**1001-1200 g**	**1201-1500 g**	**1501 g <**
Live weight – 21 days (kg)	6.57 ± 0.41 ^{A}	6.84 ± 0.42 ^{B}	7.02 ± 0.44 ^{C}	8.12 ± 0.78 ^{ABC}
Live weight – weaning (kg)	6.77 ± 0.74 ^{AB}	7.40 ± 0.81 ^{C}	8.01 ± 0.78 ^{A}	8.67 ± 1.12 ^{BC}
Live weight – 38 days (kg)	8.62 ± 1.17 ^{AB}	9.51 ± 1.62 ^{c}	10.78 ± 1.71 ^{A}	11.50 ± 1.92 ^{Bc}
Live weight – 4 w before slaughter (kg)	74.17 ± 3.76 ^{aAB}	83.67 ± 11.10 ^{aCD}	94.76 ± 7.75 ^{AC}	102.67 ± 6.55 ^{BD}
Live weight – 2 w before slaughter (kg)	86.33 ± 4.99 ^{AB}	95.17 ± 12.18 ^{CD}	109.47 ± 8.32 ^{AC}	116.33 ± 7.23 ^{BD}
Live weight – slaughter (kg)	98.83 ± 6.41 ^{aAB}	108.58 ± 12.18 ^{aCD}	122.06 ± 7.35 ^{bAC}	132.50 ± 7.27 ^{bBD}
ADG - preweaning	241.67 ± 26.30 ^{AB}	264.29 ± 28.79 ^{C}	286.13 ± 27.96 ^{A}	309.52 ± 39.86 ^{BC}
ADG from birth to slaughter	546.04 ± 35.44 ^{aAB}	599.91 ± 67.27 ^{aCD}	674.36 ± 40.62 ^{bAC}	732.04 ± 40.19 ^{bBD}

^{ab} means with the same superscripts differ significantly P<0.05
^{AB} means with the same superscripts differ highly significantly P<0.01

Figure 1. Growth intensity of piglets with different birth weight



Conclusion

Birth weight of pigs impacts their growth ability. Pigs with low birth weight begin life smaller, gain less during all phases of production and they are lighter at the end of fattening period.

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