

EFFECT OF BIRTH WEIGHT ON GROWTH EFFICIENCY IN PRESTICE BLACK PIED PIGS AND COMMERCIAL HYBRID PIGS

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Abstract

The objective of this study was to estimate the effect of piglet birth weight on future growth intensity of Prestice Black-Pied (PC) pigs and hybrid (H) pigs (LW x L x LW sire line). The pigs were divided in three groups according the birth weight (less than 1 kg, from 1.1 to 1.5 kg and more than 1.51 kg). The experiment was terminated when the pigs reached a slaughter weight, at 181 days of age and average live weight 116.24 kg in H pigs and 197 days of age and 98.65 kg in PC pigs. The positive effect of birth weight of piglets on their growth intensity was found in our study. There were found statistically significant differences in live weight at weaning ($P \leq 0.001$) and slaughter weight ($P \leq 0.001$) in PC and H pigs.

Key words: Prestice Black-Pied breed; hybrid pig; growth; birth weight

Performance of pigs from birth to slaughter is a result of a complex interaction of factors, with the early stages of a pig's life likely to affect lifetime performance. During the preweaning stage, piglets are reliant on the sow for nutrition, and sibling competition is likely to affect growth, in particular for low birth weight piglets (Douglas et al., 2014). With increasing litter size is connected a decrease of birth weight and the higher number of small piglets (Quiniou et al., 2002; Boulot et al., 2008). The piglet birth weight is an important parameter for survival (Fix et al., 2010). A low body weight (BW) at birth and high within-litter variation are two of the most important factors impairing profitability in pork production. These parameters have been shown to have significant effects on piglet subsequent mortality rate, growth performance, carcass, and meat quality traits (Quiniou et al., 2002; Rehfeldt and Kuhn, 2006; Bérard et al., 2010; Fix et al., 2010). 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 piglets with birth weight higher than 1.2 kg are considered to be viable and reach the maximum of its production efficiency (Herčík, 2003).

The objective of this study was to estimate the effect of piglet birth weight on future growth intensity of Prestice Black-Pied pigs and hybrid pigs. The autochthonous Prestice breed is characterised by many valuable traits, such as a high degree of adaptability to environmental conditions, resistance to climate stress, local parasites and pathogens, and better use of local feed sources. Under normal intensive fattening conditions, it is characterized by less favourable carcass value and cannot be compared with performance of modern meat breeds and hybrids (Matoušek et al., 2013).

Material and Methods

The study was carried out on a total of 70 pigs of the indigenous Prestice Black-Pied breed (PC) and 82 pigs of the three-breed commercial hybrid (H) of Large White × Landrace × Large White (sire line). The experiment was terminated when the pigs reached a slaughter weight, at 181 days of age and average live weight 116.24 kg in H pigs and 197 days of age and 98.65 kg in PC pigs. Pigs were fed with commercial feed mixtures for appropriate phase of growth. Pigs were weighted individually at birth, weaning and one day before slaughter. At the end of the experiment, individual average daily gain was calculated for the period from the birth to weaning and from the birth to slaughter. The analysis of variance was used for statistical analysis in QCExpert software. The pigs were divided in three groups according the birth weight (less than 1 kg, from 1.1 to 1.5 kg and more than 1.51 kg). The effect of birth weight was determined for both genotypes but they were not compared because of different age of slaughter. PC pigs showed lower growth intensity and that's why it was not possible to finish the experiment at the same age of PC and H pigs.

Results and Discussion

Although the results of the two genotypes were not compared, it is well known that hybrid pigs reach higher growth intensity than indigenous breeds. Trends of low growth intensity in indigenous breeds have been documented by many studies (Leenhouders and Merks, 2013; Fortina et al., 2005; Jiang et al., 2011). Tang et al. (2008) studied the effects of breed, sex and birth parity on the traits of growth, carcass and meat quality were investigated in three different breeds including Swedish Landrace, British Large White and an indigenous Chinese breed – Tongcheng pigs. Tongcheng pigs had the significantly lowest average daily gain, poorest feed conversion efficiency and highest age to market. In our experiment, PC pigs reached the slaughter weight later than H pigs. PC pigs were slaughtered at the age of 197 days, H pigs at

the age of 181 days and they had more intensive growth. Dostálová et al. (2012) states that at the same length of fattening period, the Přeštice Black Pied pigs reach a lower weight, at the age of 186 days the weight of hybrid pigs of the combination (BUxL) x (HxPN) is 114 kg, but in Přeštice Black Pied pigs 92 kg. This corresponds to the average weight gain of 860 resp. 650 g/day.

The litter size was not monitored in the study. But the litters are smaller in PC pigs than in H pigs. That is probably the cause of higher number of piglets with birth weight higher than 1.5 kg in PC pigs (44 % of piglets) compared with H pigs where the highest number of piglets was with average birth weight 1.1-1.5 kg (70.7 %).

The positive effect of birth weight of piglets on their growth intensity was found in our study (Table 1 and Table 2). There were found statistically significant differences in live weight at weaning ($P \leq 0.001$) and slaughter weight ($P \leq 0.001$) in PC and H pigs. According Damgaard et al. (2003), pigs weighing less than 3.6 kg at weaning require a higher level of management (individual pig care, penning lightweight piglets separately from the larger group of newly weaned pigs) and more complex diets, which increases production costs for pork producers. Piglets weighing less than 1 kg at birth have very little chance of still being alive at weaning or of producing a standard pig. Light-birth-weight pigs have lower body weights in subsequent phases.

The both genotypes, PC and H pigs, are compared in Figures 1-4. The growth intensity was higher in H pigs, they achieved higher average daily gain from birth to weaning and from birth to slaughter. In both genotype sis evident that the growth parameters were higher in groups of piglets with higher birth weight ($P \leq 0.001$). 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. Quiniou et al. (2002) found 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 parameters in Prestice Black Pied pigs

| Growth parameter | Birth weight | | | P-value |
|---|--------------------------------|-------------------------------|--------------------------------|---------|
| | < 1 kg mean ± SD | 1.1– 1.5 kg mean ± SD | 1.5 kg < mean ± SD | |
| Live weight at weaning (kg) | 4.655 ± 1.634 ^{aA} | 6.551 ± 1.938 ^a | 7.847 ± 1.321 ^A | ≤0.001 |
| Live weight at slaughter (kg) | 90.234 ± 17.145 ^A | 97.911 ± 14.700 ^a | 109.080 ± 11.723 ^{aA} | ≤0.001 |
| Average daily weight gain birth – weaning (g/day) | 124.481 ± 38.256 ^{aA} | 171.329 ± 42.465 ^a | 198.467 ± 42.814 ^A | ≤0.001 |
| Average daily weight gain birth - slaughter (g/day) | 451.231 ± 86.698 ^A | 490.870 ± 77.633 ^a | 565.936 ± 54.620 ^{aA} | ≤0.001 |

^a means with the same superscripts differ significantly P<0.05

^A means with the same superscripts differ highly significantly P<0.001

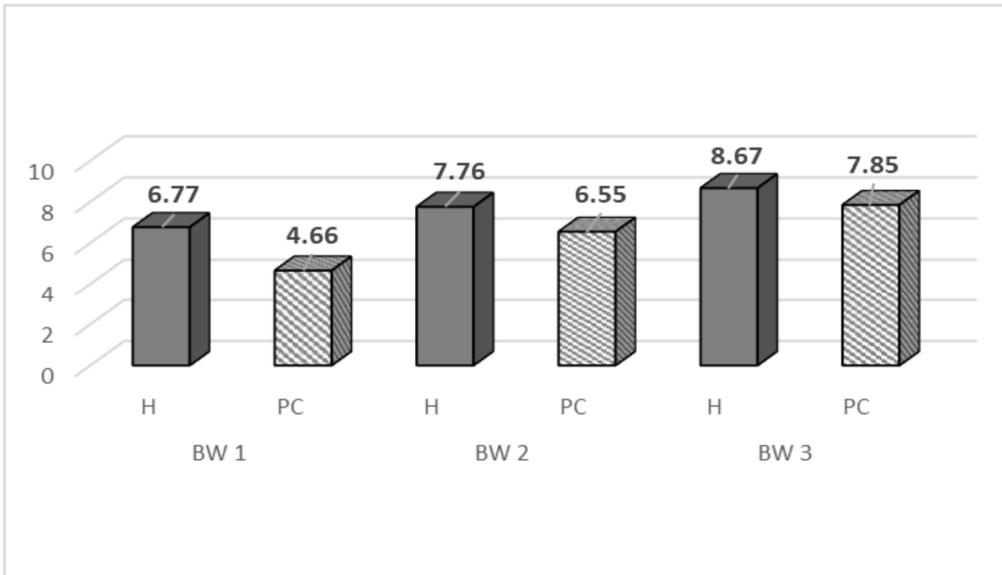
Table 2. Effect of birth weight on growth parameters in hybrid pigs

| Growth parameter | Birth weight | | | P-value |
|---|--------------------------------|--------------------------------|--------------------------------|---------|
| | < 1 kg mean ± SD | 1.1 – 1.5 kg mean ± SD | 1.5 kg < mean ± SD | |
| Live weight at weaning (kg) | 6.767 ± 0.769 ^{aA} | 7.759 ± 0.855 ^{ab} | 8.667 ± 1.166 ^{Ab} | ≤0.001 |
| Live weight at slaughter (kg) | 98.833 ± 6.699 ^{AB} | 116.483 ± 11.810 ^{AC} | 132.500 ± 7.598 ^{BC} | ≤0.001 |
| Average daily weight gain birth – weaning (g/day) | 241.667 ± 27.468 ^{aA} | 277.094 ± 30.547 ^{ab} | 309.524 ± 41.631 ^{Ab} | ≤0.001 |
| Average daily weight gain birth - slaughter (g/day) | 546.041 ± 37.012 ^{AB} | 643.551 ± 65.250 ^{AC} | 732.044 ± 41.977 ^{BC} | ≤0.001 |

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

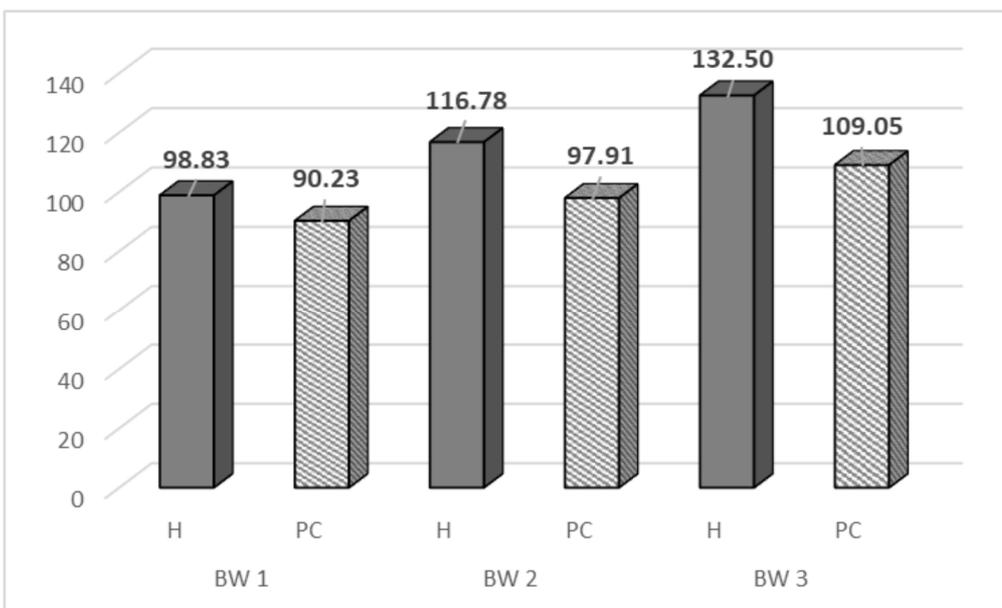
^{ABC} means with the same superscripts differ highly significantly P<0.001

Figure 1. The effect of birth weight on live weight at weaning in Prestice Black Pied pigs and hybrid pigs



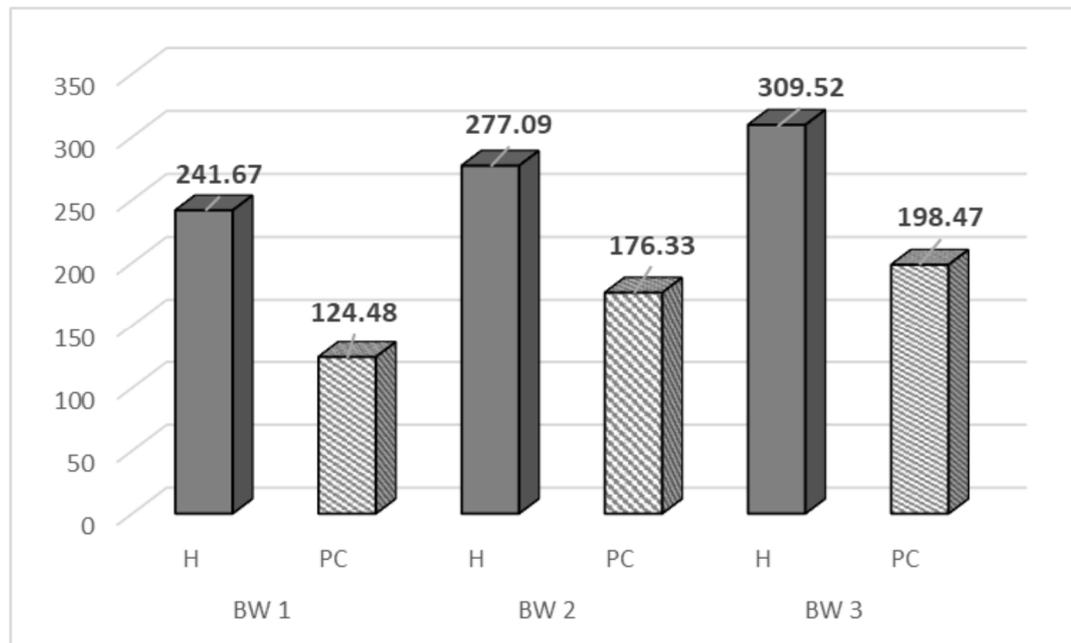
BW1 – live body weight at birth < 1.0 kg, BW2 - 1.1 – 1.5 kg, BW 3 - 1.51 kg and more
 H – hybrid pigs, PC – Prestice Black Pied pigs

Figure 2. The effect of birth weight on live weight at slaughter in Prestice Black Pied pigs and hybrid pigs



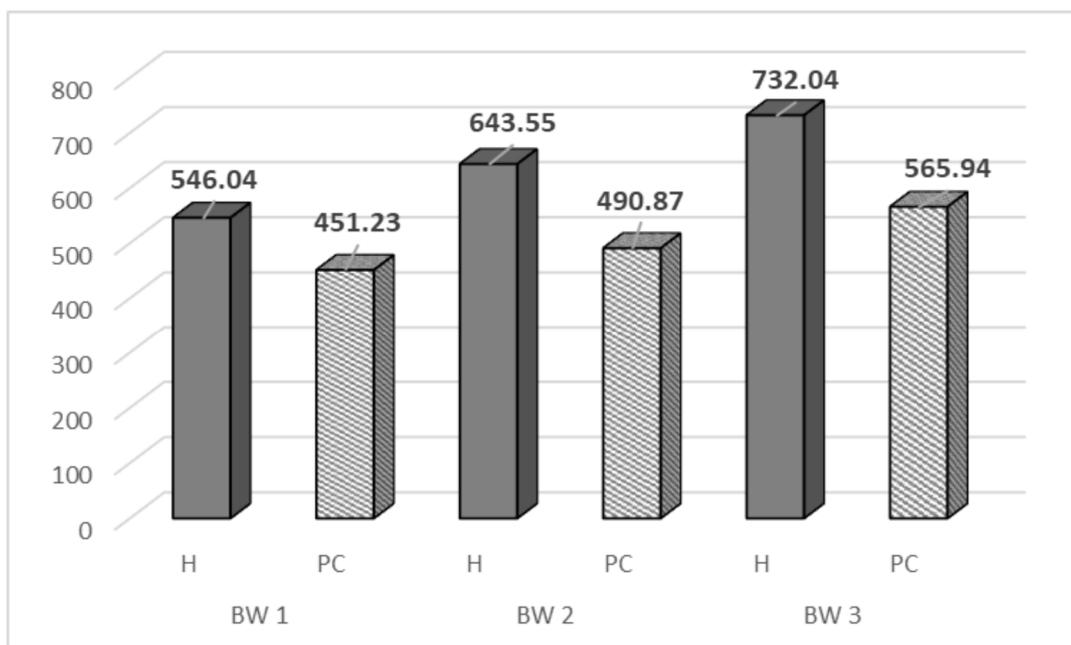
BW1 – live body weight at birth < 1.0 kg, BW2 - 1.1 – 1.5 kg, BW 3 - 1.51 kg and more
 H – hybrid pigs, PC – Prestice Black Pied pigs

Figure 3. The effect of birth weight on average daily weight gain from birth to weaning in Prestice Black Pied pigs and hybrid pigs



BW1 – live body weight at birth < 1.0 kg, BW2 - 1.1 – 1.5 kg, BW 3 - 1.51 kg and more
 H – hybrid pigs, PC – Prestice Black Pied pigs

Figure 4. The effect of birth weight on average daily weight gain from birth to slaughter in Prestice Black Pied pigs and hybrid pigs



BW1 – live body weight at birth < 1.0 kg, BW2 - 1.1 – 1.5 kg, BW 3 - 1.51 kg and more
 H – hybrid pigs, PC – Prestice Black Pied pigs

Conclusion

The objective of this study was to estimate the effect of piglet birth weight on future growth intensity of Prestice Black-Pied pigs and hybrid pigs. Although the results of the two genotypes were not compared, it is well known that hybrid pigs reach higher growth intensity than indigenous breeds. The positive effect of birth weight of piglets on their growth intensity was found in our study.

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