AN INFLUENCE OF BIRTH WEIGHT OF PIGLETS ON FEEDING QUALITY AND CARCASS VALUE

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Abstract

The aim of an experiment was to find out an influence of birth weight of piglets on indicators of feeding quality and carcass value in tested hybrid combination (CLW x CL) x D. These data were determined in experiment: birth weight of piglets, weaning weight of piglets, average daily gain from birth till slaughter, weight of carcass modified body, slaughter weight of carcass pigs, depth of muscle, back fat thickness, meatiness of carcass modified body. Five groups according to weight were created to find out an influence of birth weight of piglets on feeding quality and carcass value: lesser than 1.00 kg, 1.10 – 1.20 kg, 1.30 – 1.50 kg, 1.60 – 1.80 kg and bigger than 1.80 kg.

Birth weight of piglets of hybrid combination (CLW x CL) x D was 1.47 kg. Statistically conclusive ($P \leq 0.01$) higher birth weight (1.51 kg) was reached by boars compared to gilts (1.42 kg). Piglets with lower birth weight reached lower weaning weight, weight of modified carcass body and lower growth ability (daily gain from birth till slaughter) in comparison with piglets with higher birth weight.

The lowest back fat thickness (12.01 mm) was reached in a group of pigs with birth weight 1.10 – 1.20 kg and similar level (12.03 mm) was reached in a group with birth weight higher than 1.80 kg. The highest back fat thickness (13.3 mm) was reached by pigs with birth weight lower than 1.00 kg. The highest average meatiness (58.17 %) or rather (58.12 %) was found out in carcass pigs with birth weight in range 1.60 – 1.80 kg or rather 1.30 – 1.50 kg. Contrarily the lowest meatiness 57.62 % was found out in pigs with the lowest birth weight lesser than 1.00 kg.

Key Words: Birth weight of piglets, weaning weight of piglets, feeding quality, carcass value

Fertility is a basic prerequisite for maintaining and developing of animal population. It has a key position in breeding of every kind of farm animal. It is responsible for profitability and it displays good state of health. Persistence and intensity of fertility are specific and depend on breed, genotype and primarily on living conditions. Good reproductive functions run only during favourable breeding conditions.

In every breeding with production of carcass pigs good reproduction is a key for success and it has impact on efficiency or losses of the breeding. Every improvement is projected to total profitability of the breeding.

Number, birth weight and viability of piglets in a litter have an economic importance for breeder. Birth weight of piglet determines intensity of fattening. Basic prerequisite for quality meat production it is balanced litter and piglets with average birth weight. Birth weight is decisive for survival of piglet from birth till weaning. Alonso – Spilsbury et al. (2007) point out in their study that low birth weight of piglets is one of the mortality reasons from birth till weaning. They mention the highest percentage of mortality (10 – 20 % from live born piglets) in pigs it is in period from birth till weaning. Optimal weight of live born piglet should be between 1.3 – 1.6 kg. Critical weight is less than 1 kg. If the piglet with such a low birth weight will not die till weaning, low birth weight has an influence on its following growth. That kind of piglet will reach carcass weight later, fattening is longer and for breeder it means higher costs for stabling and feeding. Piglets with birth weight up to 0.8 kg are considered as unsuitable for breeding. Magnabosco et al. (2015) confirmed in their study piglets with lower birth weight than 1.1 kg have higher mortality and because of lower colostrum intake they have lower growth ability in comparison with piglets with higher birth weight. With growing number of piglets in a litter the birth weight is decreasing which has influence on results during weaning and in following period of their life till the end of fattening. Piglets from

numerous litters show lower growth ability and subsequently lower carcass value.

Nevertheless birth weight of piglets is not related with litter size only, but with genotype (Ritter et al., 1992, Leenhouwers et al., 1999), with a litter order and a size of placenta too (Biensen et al., 1999).

Material and Methods

The aim of an experiment was to find out an influence of birth weight of piglets on indicators of feeding quality and carcass value in tested hybrid combination (Czech Large White x Czech Landrace) x Duroc - (CLW x CL) x D.

Test of carcass pigs in identical environmental conditions in chosen commercial breeding was done to reach goals of experiment. Hybrids F1 generation Czech Large White x Czech Landrace (CLW x CL) were used as mothers and they were inseminated with portions of Duroc boars from station for boar semen collection at Velké Meziříčí. Tested piglets were weighted individually after birth and marked with identification number. Sex of piglet was registered to database.

These data were determined in experiment: birth weight of piglets, weaning weight of piglets, average daily gain from birth till slaughter, weight of carcass modified body, slaughter weight of carcass pigs, depth of muscle, back fat thickness, meatiness of carcass modified body.

Five groups according to weight were created to find out an influence of birth weight of piglets on feeding quality and carcass value: lesser than 1.00 kg, 1.10 – 1.20 kg, 1.30 – 1.50 kg, 1.60 – 1.80 kg and bigger than 1.80 kg.

After the end of the fattening tested pigs were slaughtered in slaughter house at Kostelec u Jihlavy. After the slaughter weight of carcass modified body (JUT) was determined and slaughter weight of animal was re-counted with coefficient. Content of lean meat was determined by invasive method with Fat-o-Meater – FOM, which determines and registers measured values by optic-electronic system and works invasively – probe has to be put into carcass body to determine measured values. Results of measuring are converted on estimated lean meat content by computer.

These statistical characterizations were determined from measured values: average, standard deviation, minimum and maximum.

Tukey test was used to determine statistical conclusive differences among recorded values. For these reasons statistical program STATISTICA 10 was used.

Results and Discussion

Table 1 shows birth weight of piglets of hybrid combination (CLW x CL) x D – 1.47 kg. Herčík (2003) recommends as viable from rearing and next growth point of view piglets with higher birth weight more than 1.20 kg. Kyriazakis (1999) mentions only 44 % of piglets with lower birth weight than 1 kg will survive till weaning. Birth weight of piglets is important for survival and postnatal growth. A lot of authors mention only low percentage of piglets with low birth weight (less than 0.8 kg) will survive till weaning (Falkenberg et al., 1994, Quiniou et al., 2002). Piglets with lower birth weight have lower weaning weight, lower growth ability and they consume more feed from birth till slaughter (Wolter et Ellis, 2001).

Statistical conclusive ($P \leq 0.01$) higher birth weight (1.51 kg) was reached by boars in comparison to gilts (1.42 kg). Bocian et al. (2012) detected in their study higher birth weight in gilts (1.35 kg) in comparison to boars (1.25 kg). Detected difference in birth weight between sexes it was statistical conclusive ($P \leq 0.05$).

Table 2 shows an influence of birth weight of piglets on traits of feeding quality and carcass value. The highest representation according to birth weight (n=162) was by piglets in weight group 1.20 – 1.50 g, a little bit less piglets (n=158) were in group 1.60-1.80 g, the lowest number (n=45) was in weight group less than 1.00 kg. 135 piglets have an average birth weight higher than 1.80 kg.

From Table 2 it is evident that piglets with lower birth weight reached lower weaning weight in comparison with piglets with higher birth weight.

Statistical conclusive difference on a level of importance $P \leq 0.05$ or rather $P \leq 0.001$ was found among values of weaning weights of piglets among individual weight groups according to birth weight. The highest average weaning weight (7.67 kg) was reached by piglets with birth weight over 1.80 kg. Group of piglets with birth weight 1.50 – 1.80 kg reached average weaning weight 6.92 kg. The most numerous weight group with birth weight 1.20-1.50 kg reached weaning

weight 6.45 kg. The lowest average weaning weight (5.54 kg) was found out in piglets with birth weight lower than 1.00 kg.

An influence of birth weight of piglets on their growth was studied by Beaulieu et al. (2010). They discovered that piglets with lower birth weight reach lower weaning weight, in 5th and 7th week after weaning and their fattening takes more time. Akdag et al. (2009) in their work proved that birth weight is determining factor for weaning weight and it is important for survival of piglets from birth till weaning. Quiniou et al, (2002), Gondret et al, (2005) during their experiments found out positive correlation between weaning weight of piglets and their birth weight. They mention higher birth weight of piglets is related to higher weaning weight.

Higher growth ability expressed by average daily gain from birth till slaughter was determined in piglets with higher birth weight in comparison with piglets with lower birth weight. The highest average daily gain (582 g) was determined in pigs with birth weight higher than 1.80 kg. Statistically conclusive (P≤0.01) lower average daily gain from birth till slaughter (535 g) was counted in pigs of weight group 1.00-1.20 kg. In the most numerous weight group (1.20-1.50 kg) an average daily gain reached 559 g. Václavková, Rozkot, Bělková (2014) studied an influence of birth weight of piglets on their growth and carcass traits. Authors divided piglets into 4 groups according to birth weight. The first group covered piglets with birth weight lower than 1000 g, the second 1001 – 1200 g, the third 1201 – 1500 g and the fourth 1501 g and more. In piglets with growing birth weight an average daily gain was growing from birth till weaning and from weaning till slaughter. Thanks to high daily gain pigs from the fourth group (birth weight 1501 and more g) reached slaughter weight for one month earlier in comparison with pigs from the second group (birth weight 1001 – 1200 g).

The highest average weight of carcass modified body (91.39 kg) was reached in carcass pigs with birth weight over 1.80 kg. On the contrary the lowest average weight of carcass modified body was reached in group of piglets with birth weight less than 1.00 kg. In piglets from group 1.20 – 1.50 kg of birth weight an average weight of carcass modified body reached 87.72 kg. Results of slaughter weight of carcass pigs correspond with weight of carcass modified bodies, i.e. pigs with birth weight over 1.80 kg reached the highest slaughter weight (116.07 kg) in comparison with pigs with lover birth weight. The lowest back fat thickness (12.03 mm) was determined in pigs from group with a birth weight over 1.80 kg. The highest back fat thickness (13.3 mm) was reached by pigs with lower birth weight than 1.00 kg. Václavková, Rozkot, Bělková (2014) discovered the same result in their experiment with measuring of back fat thickness of carcass pigs – in pigs with birth weight less than 1000 g they measured 13.3 mm of back fat thickness in comparison with pigs with birth weight over 1800 g where they measured 12.03 mm of back fat thickness. The same conclusion was done by Gondret et al. 2006, Rehfelt et al. (2008). They mention in their studies that piglets with lower birth weight have higher back fat thickness during slaughter in comparison with heavier piglets.

Wu et al., 2006; Oksbjerg et al., 2013 mention piglets with lower birth weight have slower growth, higher content of fat in the end of fattening and meat quality is worse in these pigs.

The highest average meatiness (58.17 %), or rather (58.12 %) was determined in carcass pigs with birth weight in range 1.50 – 1.80 kg, or rather 1.20 – 1.50 kg. On the contrary the lowest meatiness was determined in pigs with the lowest birth weight, i.e. less than 1.0 kg – 57.62 %. Rekiel et al. (2015) studied an influence of birth weight of piglets on meatiness and fat content too.

Table 1. *Basic statistical characterizations for trait birth weight of piglets in studied hybrid combination (CLW x CL) x D*

Sex	**Birth weight of piglets (kg)**				
	n	$\overline{x}$	S_x	X_{min}	X_{max}
Boars	366	1.51[a]	0.43	0.50	2.60
Gilts	302	1.42[a]	0.40	0.50	2.40
Total	668	1.47	0.42	0.50	2.60

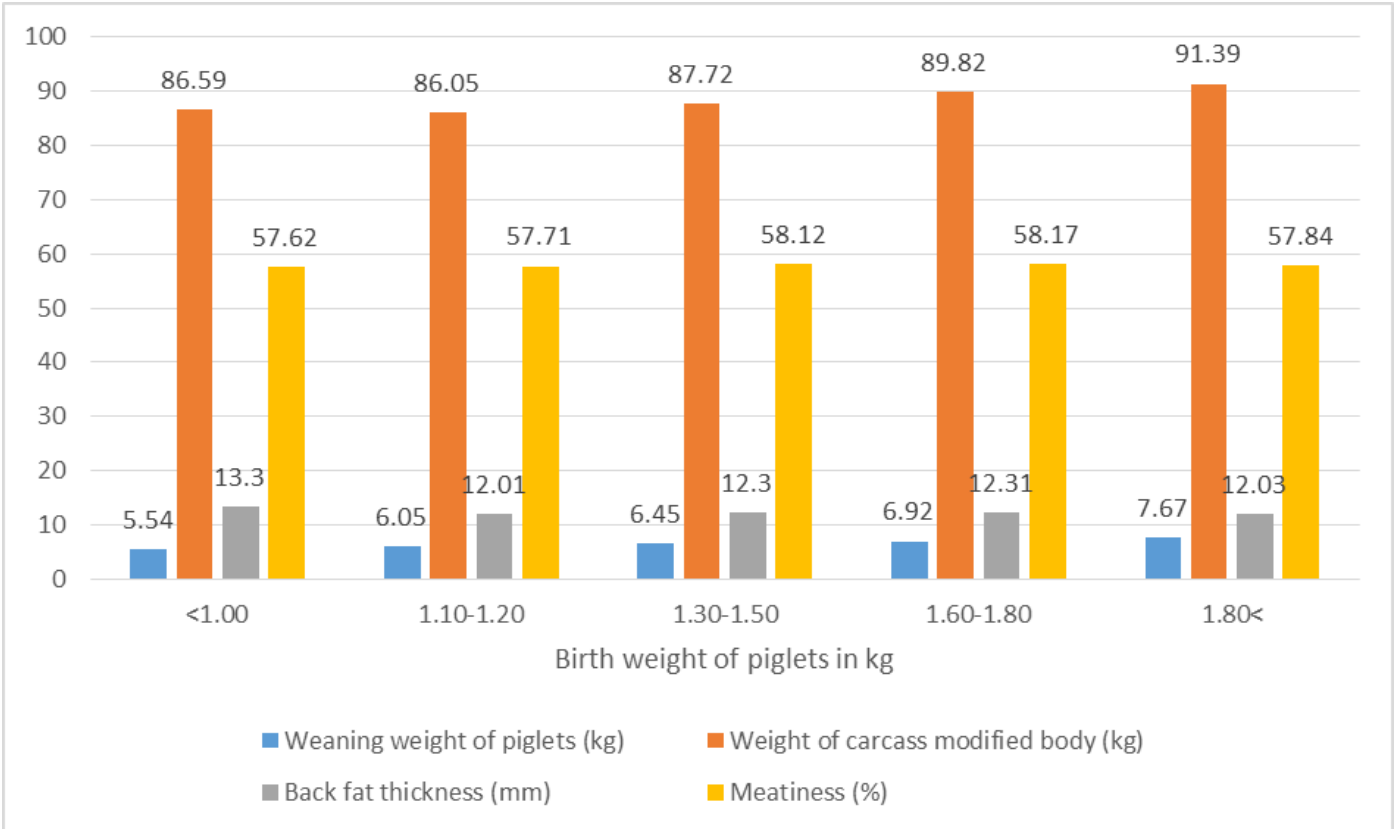
a: P≤0.01

Table 2. *Traits of feeding quality and carcass value according to birth weight of piglets*

Trait	Birth weight of piglets in kg				
	<1.00 (n = 45)	1.00 – 1.20 (n = 91)	1.30 – 1.50 (n=162)	1.60 – 1.80 (n=158)	1.80< (n = 135)
Weaning weight of piglets (kg)	$5.54^{d,e,f}$ ±1.03	$6.05^{a,g,h}$ ± 1.09	$6.45^{a,d}$ ± 0.95	$6.92^{e,g,ch}$ ± 1.09	$7.67^{f,h,ch}$ ± 1.21
Gain from birth till slaughter (g)	536 ± 54.65	535^{b} ± 48.17	559 ± 55.57	573 ± 54.52	582^{b} ± 61.45
Weight of carcass modified body (kg)	84.03 ± 8.53	84.97^{c} ± 7.58	87.72 ± 8.46	89.82 ± 8.48	91.39^{c} ± 9.00
Slaughter weight (kg)	106.72 ± 10.96	107.91 ± 9.73	111.40 ± 10.88	114.07 ± 10.90	116.07 ± 11.57
Meat thickness (mm)	60.97 ± 7.78	61.74 ± 7.68	63.36 ± 8.77	64.30 ± 6.93	63.58 ± 7.80
Back fat thickness (mm)	13.30 ± 2.70	12.75 ± 2.98	12.30 ± 2.65	12.31 ± 2.76	12.03 ± 3.06
Meatiness (%)	57.36 ± 2.63	57.40 ± 2.82	58.12 ± 2.16	58.17 ± 2.08	57.84 ± 2.78

a,b,c: P≤0.05 d,e,f,g,h,ch: P≤0.001

Graph 1*. Traits of feeding quality and carcass value according to birth weight of piglets*



Conclusion

From reached results it is possible to pronounce that piglets of studied hybrid combination (CLW x CL) x D had optimal birth weight 1.47 kg. Statistically conclusive difference was found in birth weight of piglets between sexes, when boars showed higher birth weight in comparison with gilts. Birth weight of piglets had an influence on weaning weight, slaughter weight of carcass pigs and growth ability expressed by average daily gain from birth till slaughter. Piglets with higher birth weight reached higher weaning weight and higher slaughter weight and had better growth ability i.e. higher daily gains from birth till slaughter. Carcass pigs with the lowest birth weight under 1.00 kg had higher back fat thickness in comparison with pigs with birth weight over 1.80 kg. The highest meatiness (58.12 % or rather 58.17 %) was reached by pigs with birth weight in a range 1.30 – 1.50 kg or rather 1.60 – 1.80 kg. Lower meatiness (57.36 % or rather 57.84 %) was determined in carcass pigs with birth weight under 1.00 kg, respectively over 1.80 kg.

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