THE GROWTH RATE OF LARGE WHITE BREED IN RELATION TO CARCASS AND MEAT QUALITY TRAITS

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Abstract

The aim of the research was to evaluate the effect of growth rate of Large White breed to carcass traits and chemical composition of meat. The experiment consisted of three groups of pigs with different growth rates. Every group was individually evaluated and statistically compared with two standardized fattening sexes. It was found out that the group of gilts showed statistically significant differences between the averages of groups according to the growth intensity at the level $P < 0.05$. Results showed significant differences between the averages of groups according to the growth intensity of both sexes in the indicator of the backat thickness and in the group of barrows in the weight of pork belly at the level $P \leq 0.05$. The parameters of chemical composition according to growth rate showed significant differences at the level $P \leq 0.05$ and also at the level $P \leq 0.01$ in the total protein content of the meat at both sexes.

Key Words: Growth rate, slaughter traits, sex, pigs

The main product of modern pig genotypes is meat. The greatest attention is paid today to its quality and quantity. The pig industry has focused on increasing the efficiency of muscular tissue production (Alfonso et al., 2005). The most important intensifying factors affecting the production potential are the growth rate and the slaughter traits. These properties represent a significant influence on the efficiency of breeding (Brzobohatý et al., 2012). Growth intensity resulted from the interaction of several internal factors (breed, sex, age) and external factors (nutrition, feed technology and housing) as noticed Serrano et al. (2009), Stupka et al. (2009) and Litwińczuk et al. (2004). Restricted nutrition during any age category has a braking effect on a successful growth (Tvrdoň, Čechová, 2000; Weremko et al., 2013; Tartrakoon et al., 2016), reduces carcass fatness and also intramuscular fat level, resulting in decreased meat tenderness or juiciness (Lebret, 2008). In fact, growth rate is an effective indicator in pig selection; the faster growth rate is associated with a lower need for care and thus a saving cost for feed (Webb and Casey, 2010). Very little is known about the combined or interactive effect of growth rate on carcass traits and meat quality (Correa et al., 2006). The correlations between growth rate and meat quality traits are generally small and negative, but their values may depend on the considered breed (de Vries et al., 1994, Bidanel and Ducos, 1995). The knowledge of the relationships between production parameters and meat quality traits is necessary for the development of selective programs that emphasize product quality (Latorre et al., 2008).

Material and Methods

The aim of the experiment was to consider the impact of growth rate of pigs on the selected parameters of carcass value and meat quality. The experiment was carried out in the standard fattening conditions of Experimental Center of the Department of Special Animal Husbandry. The experiment tested 125 pigs of Large White breed (59 barrows and 66 gilts). The test period was from 30 to 100 kg of live weight. The pigs were divided according to the growth rate into three separate groups, using three different feed mixtures in the growth phases from 30 to 50 kg (OŠ-3), 50 to 75 kg (OŠ -4) and 75 to 100 kg (OŠ-5).

The dissection of the carcass pigs was done according to legislation and standard practises STN 466164. The basic variability and statistical characteristics were determined for the individual groups and the monitored indicators. Comparison of experimental groups was evaluated on individual indicators of means by single-factor analysis of variance.

Results and Discussion

According to comparison of the carcass traits in groups of pigs divided by the growth rate, we did not notice a significant difference in any selected parameters of barrows, whereas the results of gilts showed the decreasing curve of the meat content in relation to the increasing growth intensity (Tab. 1), what was significant in the percentage of lean meat parts. The results are confirmed by Čítek et al. (2001), who found a higher proportion of meat in pork belly in gilts than in barrows; the increasing growing rate reduced the proportion of meat: fat. We observed slightly increasing parameters of fatness in barrows due to the increasing growth rate. According to Correa et al. (2008), the backfat thickness increased by weight (P<0.01). Tested gilts characterized by high daily gains of body weight had higher meat content in proper ham, loin, belly and total primary cuts weight as compared with animals of lower growth rate (Nowachowicz et al., 2009). Statistically significant differences of our experiment in fatness were confirmed in gilts, particularly in the increasing weight of the pork belly and the backfat thickness according to the increasing average daily gain what is consistent with the results of Yang et al. (2012) who indicated that pigs with higher growth rate had heavier ($P < 0.05$) final body weight, carcass weight, dressing percentage, backfat thickness, higher ($P < 0.05$) concentrations of fat in the muscle. Creation and storage of meat in pork belly is more uniform in gilts, because the production of meat and fat in barrows during growth is uneven (Stupka, 2002). The parameters of the chemical composition of the meat (Tab. 2) showed no significant differences in the total water content in gilts and barrows in relation to the groups divided by the growth rate. For both sexes, it was found a decrease in total protein content in pork due to increasing growth intensity, which was also statistically significant. Our measurements showed increasing proportion of intramuscular fat in barrows and gilts due to their increasing growth intensity, but this was statistically significant only in gilts. According to Latorre et al. (2008), fast-growing pigs have lower intramuscular fat content. The composition of intramuscular fat in the ratio of fatty acid groups does not show a significant dependence on the growth rate of the two studied sexes.

Table 1. *Basic statistical characteristics of carcass traits*

Sex	**Barrows (n=59)**			**Gilts (n=66)**		
Groups by growth rate	**< 800**	**800-900**	**> 900**	**< 800**	**800-900**	**> 900**
Carcass traits	$\overline{y} \pm s$	$\overline{y} \pm s$	$\overline{y} \pm s$	$\overline{y} \pm s$	$\overline{y} \pm s$	$\overline{y} \pm s$
Half carcass (kg)	40,07±1,67	40,50±2,00	40,61±1,57	40,42±1,57	39,63±1,75	40,86±1,96
Lean meat cuts (%)	52,93±2,96	53,21±2,54	53,05±1,96	**55,40±2,18^{a}**	**54,04±1,72^{b}**	**53,67±1,55^{b}**
Meat from the thigh (%)	21,32±1,32	21,61±1,19	21,35±1,10	22,80±1,15	22,19±,95	22,11±1,39
Loin eye area (cm^2)	39,95±6,30	41,01±3,26	40,23±4,32	45,67±5,79	44,49±4,98	43,38±4,54
Pork belly (kg)	7,95±0,45	7,88±0,55	8,09±0,49	**7,69±0,51^{a}**	7,84±0,43	**8,00±0,26^{b}**
Weight of backfat (kg)	3,05±0,77	3,01±0,67	3,16±0,33	2,68±0,39	2,84±0,45	2,74±0,21
Weight of fat from thigh (kg)	1,57±0,45	1,73±0,27	1,72±0,21	1,47±0,22	1,55±0,21	1,54±0,12
Kidney fat (kg)	0,55±0,29	0,61±0,21	0,55±0,15	0,45±0,13	0,44±0,15	0,42±0,14
Backfat thickness (cm)	**1,86±0,58^{a}**	2,05±0,43	**2,12±0,30^{b}**	**1,68±0,33^{a}**	1,72±0,40	**1,89±0,21^{b}**

Groups divided by growth rate: Barrows:< 800 (n=14); 800-900 (n=17); > 900 (n=28), Gilts:<800 (n=36); 800-900 (n=19); > 900 (n=11)
A,B Different letters denote significant differences between groups at P≤0.01
a,b Different letters denote significant differences between groups at P≤0.05

Table 2. *Basic statistical characteristics of chemical composition of longissimus thoracis muscle*

Sex	**Barrows (n=59)**			**Gilts (n=66)**		
Groups by growth rate	**< 800**	**800-900**	**> 900**	**< 800**	**800-900**	**> 900**
Chemical parameters	$\overline{y} \pm s$	$\overline{y} \pm s$	$\overline{y} \pm s$	$\overline{y} \pm s$	$\overline{y} \pm s$	$\overline{y} \pm s$
Total water (%)	72,14±0,68	72,46±0,62	72,23±0,72	72,66±0,99	73,07±0,88	73,02±0,71
Protein (%)	24,55±0,96^{Aa}	23,98±0,71^{b}	23,83±0,78^{B}	24,53±0,81^{A}	24,26±0,81^{ab}	23,73±0,40^{Bb}
Intramuscular fat (%)	1,77±0,59	1,96±0,62	2,19±0,95	1,45±0,76	1,27±0,65^{a}	1,84±0,54^{b}
Saturated fatty acids (g.100g^{-1})	37,91±1,90^{A}	39,23±1,68^{aB}	38,30±1,15^{b}	38,61±1,77	39,11±1,47	38,21±1,20
Monounsaturated fatty acids	52,17±3,11	52,83±2,63	52,87±2,48	52,04±2,70	52,97±2,71	52,41±2,18
Polyunsaturated fatty acids	10,60±1,80	9,95±1,95	10,30±1,70	11,13±1,67	10,49±2,09	10,45±1,76
ω3 polyunsaturated fatty acids	0,47±0,08	0,48±0,09	0,48±0,08	0,50±0,05^{a}	0,46±0,08^{Ab}	0,54±0,08^{B}
ω6 polyunsaturated fatty acids	9,56±1,74	9,26±2,01	9,52±1,64	10,32±1,62	9,71±2,18	9,61±1,89

Groups divided by growth rate: Barrows:< 800 (n=14); 800-900 (n=17); > 900 (n=28), Gilts:<800 (n=36); 800-900 (n=19); > 900 (n=11)
A,B Different letters denote significant differences between groups at P≤0.01
a,b Different letters denote significant differences between groups at P≤0.05

Conclusion

It can be concluded that the results in this study showed the direct effect of growth rate of pigs on carcass traits of fattening pigs and also the influence to the nutritional composition of pigs of standard fattened sex.

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