ACTA UNIVERSITATIS AGRICULTURAE ET SILVICULTURAE MENDELIANAE BRUNENSIS

Volume 66 42 Number 2, 2018
https://doi.org/10.11118/actaun201866020389

INFLUENCES OF HOUSING SYSTEMS AND SLAUGHTER WEIGHT ON THE MARKET REALIZATION OF SLAUGHTER PIGS BY SEUROP CLASSIFICATION

Libor Sládek[1], Vladimír Mikule[1]

[1]Department of Animal Breeding, Faculty of AgriSciences, Mendel University in Brno, Zemědělská 1, 613 00 Brno, Czech Republic

Abstract

SLÁDEK LIBOR, MIKULE VLADIMÍR. 2018. Influences of Housing Systems and Slaughter Weight on the Market Realization of Slaughter Pigs by SEUROP Classification. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis,* 66(2): 389–397.

The aim of the study was to evaluate an influence of housing technology and slaughter weight of slaughter pigs on realization with SEUROP system. Slaughter pigs of hybrid combination (Czech Large White × Czech Landrace) × Duroc were studied for reasons of an experiment. Analysed were 733 pigs. Slaughter pigs fattened on deep-bedded pens reached higher slaughter weight, higher back fat thickness, higher muscle deep, higher price per 1 kg of slaughter weight in comparison with pigs on slatted floor pens, but on the contrary they reached a lower portion of lean meat. These data were determined in pigs on deep-bedded pens: 117.58 kg slaughter weight, 16.78 mm of back fat thickness, 61.30 mm of muscle deep, 55.53 % of lean meat portion and price 32.15 Kč per 1 kg of slaughter weight. These data were determined in pigs reared on slatted floor pens: 110.82 kg slaughter weight, 14.38 mm of back fat thickness, 56.67 mm of muscle deep, 57.11 % of lean meat portion and price 31.86 Kč per 1 kg of slaughter weight. A statistical conclusive difference on a level of importance $P \leq 0.01$ was found between pigs bred on deep-bedded pens and on slatted floor pens in traits slaughter weight, back fat thickness, muscle deep and meatiness. From experiment it is obvious that for 1 kg of slaughter weight in all business classes SEUROP higher price was in pigs fattened on deep-bedded pens in comparison with pigs fattened on slatted floor pens.

Keywords: slaughter pig, lean meat portion, slaughter weight, back fat thickness

INTRODUCTION

Litter-housing systems are suitable for fattening of pigs from climate creation point of view. They allow partial reduction of thermal demands in comparison with litter-free housing systems. Litter-housing systems are getting popular because of welfare requirements and lower acquisition costs. These systems are used especially in smaller and moderate-sized pig breeders. Disadvantages of litter-housing system could be in higher depositing of fat in slaughter pigs for approximately 15 %, lower gains and longer fattening period. Litter-housing systems have strengths from welfare point of view, but there could arise some health problems too. Generally litter-housing is used in houses with natural ventilation where frequent air change has a positive influence on health condition of animal respiratory system. In a case of litter-free housing system arrangement of grate floor respectively a partially grate floor is necessary to reduce total water vapour production. Benefits of litter-free housing system are maximal utilization of housing space, reduction of keeper labour-intensity and achievement of required hygienic conditions for pigs and staff.

With growing pig slaughter weight portion of meaty and fatty parts is changing and with this

a carcass value is changing too. According to Lucas *et al.* (2017) traits of carcass modified body as back fat thickness, muscle deep and portion of lean meat are very important parameters used for quality evaluation of carcass modified body.

Several studies showed that increase of slaughter weight of fattened pigs reduces quality of carcass modified body and meat quality (Latorre *et al.*, 2004, Czyzak-Runowska *et al.*, 2015). At the same time growing slaughter weight increases age of slaughtered pigs for 1.5 days per kg (Čandek-Potokar *et al.*,1998). Conte *et al.* (2011) mentions in his study that increase of pigs slaughter weight is one of the options which increases profitability and competitiveness of pig producers. It is estimated that increase of carcass modified body weight for 10% could reduce average producer's costs for 3–5 cents/kg. According to Sieczkowska *et al.* (2008) meat industry prefers higher slaughter weight of carcass pigs, but many authors like Zybert *et al.* (2001), Gardzińska *et al.* (2002) and others mention lighter carcass pigs have higher meatiness compared to heavier pigs. Mentioned dependence corresponds with finding of Pulkrábek and Pavlík (2000), when he proved that with reduction of slaughter weight for 10 kg lean meat portion increases in pig carcass body for 1.5% and vice versa. Wähner (2002) mentions portion of lean meat should be between 58 and 60% during slaughter. According to Stege *et al.* (2011) slaughter pigs in Denmark have some weight restrictions and they have high lean meat portion. These pigs have the best prices on slaughter. Optimal values are given according to consumers demands. According to Oliveira *et al.* (2015) today thanks to genetics pigs were improved to have maximum potential for protein saving even in higher slaughter weights, but still an optimal slaughter weight should be determined. Many studies are concerned with an influence of slaughter weight on development of growth and quality of carcass modified body (Correa *et al.*, 2006).

Growth curves differ in different breeds, especially in original breeds, when growth is quite often delayed. Slaughter weight and weight of carcass modified body are different in whole world from very light (5–20 kg) till very heavy pigs (about 180 kg) which are used for production of special ham prosciutto in Italy. Generally in carcass pigs bred in Europe slaughter pigs with slaughter weight range from 110 till 120 kg are the most desired (Boland *et al.*, 1996).

Unbalanced slaughter weights could be created by inappropriate environment in some category of pigs as well as by using of inappropriate final hybridization (Svoboda, 2001). In this context it is very important that pig producers should be focused on such combination of final hybrids which will meet required carcass value and will be the most profitable. An influence of used pig breeds on carcass value was studied by Pulkrábek *et al.* (2015), Branscheid *et al.* (2011) and others. It is clear from their studies that today genetic base is lowered on several world-wide used pig breeds Large White, Landrace, Duroc, Hampshire and Pietrain. These breeds form a base of hybridization program in the Czech Republic too.

The aim of the study was to evaluate an influence of housing technology and slaughter weight of carcass pigs on realization with SEUROP system.

MATERIALS AND METHODS

Slaughter pigs of hybrid combination (Czech Large White × Czech Landrace) × Duroc were studied for reasons of an experiment. Analysed were 733 pigs. Hybrids of F1 generation Czech Large White × Czech Landrace (CLW × CL) were used as dams. They were inseminated with portions of Duroc boars from insemination boar stations. Fattening of slaughter pigs ran separately according to housing system in two fattening halls. In the first fattening hall a litter-free housing system on slatted floor pens was used (417 experimental pigs with 110.82 kg of a live weight in the end of fattening) and in the second hall pigs were fattened on deep-bedden pens (316 pigs with 117.58 kg of live weight in the end of fattening). Pigs were fed with common commercial feeding mixtures.

After the end of fattening tested pigs were slaughtered in a slaughter house and weight of carcass modified body was determined. Slaughter weight of animal was calculated by coefficient. Lean meat portion in tested animals was determined by ultrasound apparatus IS-D-05.

Apparatus IS-D-05 for classification of carcass modified bodies of pigs into individual classes SEUROP it is a device for measuring of muscle deep and back fat thickness on a base of ultrasound impulse reactions which are gradually transferred into exactly determined spot on carcass modified body.

Lean meat portion (meatiness) of carcass modified body is calculated by following equation:

$$Y = 60.69798 - 0.89211S_{IS\text{-}D\text{-}05} + 0.10560M_{IS\text{-}D\text{-}05}$$

Where:

Y = estimated percentage of lean meat portion (meatiness) in carcass modified body

S (IS-D-05) = back fat thickness including skin (mm) in a point of measuring 70 mm from longitudinal axis of carcass modified body between the second and the third last rib (mm)

M (IS-D-05) = muscle deep in a point of measuring 70 mm from longitudinal axis of carcass modified body between the second and the third last rib (mm)

Analysis of carcass value results in tested slaughter pigs was done according to slaughter weight in accordance of following intervals: 80–89 kg; 90–99.9 kg; 100–109.9 kg; 110–119.9 kg; 120–129.9 kg and 130 and more kg and then according to business classification by SEUROP system, it means with

percentage of lean meat portion higher than 60 (S), 55–59.9 (E), 50–54.9 (U), 45–49.9 (R), 40–44.9 (O).

Basic statistical characterizations were determined in studied traits – mean and standard deviation. Conclusiveness among individual studied traits was calculated by Tukey – HSD test. Pearson correlation was used for determination of dependence among slaughter weight and traits of carcass value. Statistical program STATISTIKA 10 was used for these purposes.

RESULTS AND DISCUSSION

From reached results it is obvious that pigs fattened on deep-bedden pens reached higher slaughter weight (117.58 kg) for approximately 7 kg on the contrary to pigs fattened on slatted floor pens with slaughter weight 110.82 kg. Czyzak-Runowska *et al.* (2015) refer heavier pigs produce worse quality pork three times more often than pigs with lower slaughter weight.

Pigs on deep-bedded pens reached higher back fat thickness, higher muscle deep, higher price per 1 kg of slaughter weight, but they had lower percentage of lean meat compared to pigs on slatted floor pens. In pigs on deep-bedded pens 16.78 mm of back fat thickness, 61.30 mm of muscle deep, 55.53 % of meatiness and price per 1 kg of slaughter weight 32.15 Kč was determined. In pigs bred on slatted floor pens 14.38 mm of back fat thickness, muscle deep 56. mm, 57.11 % of lean meat percentage and price 31.86 per 1 kg of slaughter weight was determined. Between pigs fattened on deep-bedded pens and pigs fattened on slatted floor pens a statistical conclusive difference on a level of importance $P \leq 0.01$ was determined in slaughter weight, back fat thickness, muscle deep and meatiness.

The highest number of slaughtered pigs (156) was in weight range 110–119.9 kg with an average weight 114.34 kg. The same discovery is mentioned by David *et al.* (2016) – he presents that today in the Czech Republic carcass pigs are fattened till slaughter weight in a range from 110 till 120 kg. Just for several animals smaller group of pigs (149) was in a weight range 100–109.9 kg (average 105.10 kg). The smallest groups were groups of pigs with slaughter weight under 80 kg (1), 80–89.9 kg (49) and 140 kg and more (38).

With growing slaughter weight values of back fat thickness were increasing on the contrary lean meat percentage had linear declining tendency.

The lowest trait of back fat thickness was determined in weight groups under 80 kg and 80–89.9 kg – 9.49 mm, respectively 12.00 mm. The highest value was in weight range 130–139.9 kg, respectively 140 kg and more, which represented average value 17.33 mm, respectively 17.42 mm.

Conte *et al.* (2011) discovered in their study of hybrid combination (LW × L) × LW lesser back fat thickness 11.6 mm in pigs slaughtered in 95 kg and 12.2 mm in pigs slaughtered in 105 kg compared to our findings.

In our study back fat thickness of 13.45 and 14.97 mm was determined in the average slaughter weight of 84.94 and 105.10 kg, respectively. Suzuki *et al.* (2003) determined in his experiment higher back fat thickness 18 mm in slaughter weight 109 kg in hybrid combination (Landrace × Duroc) × Duroc. Distinctively higher back fat thickness 23.3 mm in carcass hybrid pig combination (Landrace × Large White) × German Pietrain with slaughter weight 106.1 kg was determined by Cámara *et al.* (2016). Higher back fat thickness (23 mm) in 114 kg of slaughter weight in hybrid combination (L × LW) × (Pn × LW) is mentioned by Peinado *et al.* (2008), in comparison with our experiment with 15.67 mm of back fat thickness in 114.34 kg of slaughter weight.

Also muscle deep reached with growing weight higher values in all measuring of individual weight groups. Heavier pigs had higher muscle deep.

With growing slaughter weight a percentage of lean meat was decreasing which is evident from Tab. 2. Sencic *et al.* (2005) made the same conclusions with 5 weight groups of animals (90.30 kg; 100.40 kg; 110.30 kg; 120.50 kg and 130.20 kg) where they determined decreasing values of lean meat percentage (58.13 %; 57.73 %; 55.36 %; 54.93 % a 53.80 %) with growing slaughter weight.

The highest lean meat percentage was determined in pigs with slaughter weight under 80 kg, respectively with average slaughter weight 85 kg–60.33 respectively 58.62 %, then in pigs with an average slaughter weight 94.94 kg–57.69 %. Conte *et al.* (2011) detected in their experiment 59.5 % of lean meat at slaughter weight of 85 kg and 59.3 % at slaughter weight of 95 kg in hybrid combination (LW × L) × LW. Glinoubol *et al.* (2015) detected in

I: *Traits of carcass value and price per 1 kg of slaughter weight in pigs fattened on slatted floor pens and on deep-bedded pens*

	Fattening on slatted floor pen	Fattening on deep-bedden pen
Number (n)	417	316
Average slaughter weight (kg)	$110.82^{A} \pm 15.83$	$117.58^{B} \pm 16.18$
Average back fat thickness (mm)	$14.38^{A} \pm 4.90$	$16.78^{B} \pm 4.54$
Average muscle deep (mm)	$56.67^{A} \pm 9.56$	$61.30^{B} \pm 9.51$
Average lean meat percentage (%)	$57.11^{A} \pm 3.42$	$55.53^{B} \pm 3.14$
Average price per 1 kg (Kč)	31.86 ± 2.19	32.15 ± 2.51

A,B: means with different superscripts are significantly different at $P \leq 0.01$

their study 59.9% of lean meat at 101 kg of slaughter weight in hybrid combination Pietrain × Duroc.

Ruusunen *et al.* (2012) mentions in his work a lean meat percentage 58.8% at slaughter weight 110 kg in hybrid combination Norwegian Duroc × Norwegian Landrace.

According to Stege *et al.* (2011) at the present days preferred slaughter weight in Denmark is approximately 101.6 kg with 60% of lean meat.

Václavková and Bečková (2009) found out in their study lower lean meat portion in hybrid combination (CL × CLW) × (CLW-sire line × Pn) in comparison with our experiment (57.09% in gilts, 51.69% in hogs, 115 kg of average slaughter weight).

On the contrary the lowest meatiness in our experiment was reached by pigs with slaughter weight over 140 kg–55.06%.

The highest price per 1 kg of slaughter weight (32.94 Kč) was reached in slaughter pigs of weight range 100–109.9 kg at average 105.10 kg, a little bit less – 32.91 Kč, respectively 32.89 Kč was reached in pigs of weight range 110–119.9 kg (average 114.34 kg) respectively 120-129.9 kg (average 124.13 kg). Contrarily the lowest price (28.05 Kč) was detected in pigs with slaughter weight higher than 140 kg.

In all tested pigs of hybrid combination (CLW × CL) × D these average traits were determined : an average slaughter weight – 113.74 kg, back fat thickness – 15.41 mm, muscle deep – 58.67 mm, lean meat portion – 56.43% and price per 1 kg of slaughter weight – 31.98 Kč.

In slaughter pigs bred in different technologies statistical conclusive differences were determined among values of back fat thickness, lean meat percentage and prices per 1 kg of slaughter weight which were measured according to individual determined average weights.

Back fat thickness has in both groups of tested pigs ascending tendency, which means with growing slaughter weight back fat thickness was growing too. In pigs on slatted floor pens the back fat thickness was lower in all categories compared to pigs from deep-bedded pens. These differences were statistical conclusive in weight groups from 120 till 140 kg and 140 and more.

In all weight categories a higher lean meat percentage was detected in carcass pigs bred on slatted floor pens compared to pigs which were bred on deep-bedded pens. Once again an influence of slaughter weight on meatiness was confirmed. With increasing slaughter weight lean meat portion was linearly decreasing in carcass modified bodies of pigs.

Statistical conclusive difference $P \leq 0.05$ was determined in pigs bred on slatted floor pens in average slaughter weight 143.05 kg and 56.52% of lean meat compared to pigs bred on deep-bedded pens with 144.53 kg of slaughter weight and 54.39% of lean meat. Very high conclusive difference $P \leq 0.01$ was determined in average slaughter weight 123.67 kg, respectively 134.66 kg with 56.88%, respectively with 56.28% of lean meat in pigs bred on slatted floor pens compared to 124.55 kg, respectively 134.74 kg of slaughter weight with 54.71% respectively with 54.33% of lean meat determined in pigs bred on deep-bedded pens.

The highest price 33 Kč per 1 kg of slaughter weight was in pigs which were fattened on slatted floor pens in group with weight range 120–129.9 kg (average 123.67 kg), in contrast to pigs which were fattened on deep-bedded pens where it was in

II: *Carcass traits and price per 1 kg of slaughter weight within respective intervals of pigs' weight*

Weight interval	n	%	Slaughter weight (kg)	Back fat thickness (mm)	Muscle deep (mm)	Lean meat portion (%)	Price per 1 kg of slaughter weight (Kč)
Under 80	7	1	78.67 ± 1.05	9.49 ± 2.77	47.37 ± 7.43	$60.33^{b,d,e,f,g}$ ± 2.03	30.05 ± 1.35
80–89.9	49	6.7	85.00 ± 2.90	12.00 ± 3.44	48.01 ± 8.32	$58.62^{h,i,k,m,o}$ ± 2.46	29.73 ± 2.06
90–99.9	98	13.3	94.94 ± 2.85	13.45 ± 5.21	52.91 ± 7.62	$57.69^{n,j,l}$ ± 3.68	31.94 ± 1.99
100–109.9	149	20.3	105.10 ± 2.77	14.97 ± 4.94	54.62 ± 7.55	$56.67^{a,h}$ ± 3.49	32.94 ± 1.98
110–119.9	156	21.3	114.34 ± 2.82	15.67 ± 4.83	59.31 ± 8.32	$56.27^{b,n,o}$ ± 3.41	32.91 ± 1.98
120–129.9	132	18.0	124.13 ± 2.83	16.56 ± 4.38	63.08 ± 8.75	$55.73^{g,m,n}$ ± 3.04	32.89 ± 1.61
130–139.9	104	14.2	134.54 ± 2.77	17.33 ± 4.12	65.23 ± 8.15	$55.23^{a,e,f,k,l}$ ± 2.89	30.74 ± 1.90
140 and more	38	5.2	144.06 ± 2.91	17.42 ± 4.74	69.27 ± 6.29	$55.06^{d,i,j}$ ± 2.87	28.05 ± 1.56
Total	733	100	113.74 ± 16.31	15.41 ± 4.89	58.67 ± 9.80	56.43 ± 3.39	31.98 ± 2.34

a, b, c: same letters are significantly different at $P \leq 0.05$
d, e, f, g, h, i, j, k, l, m, n, o: same letters are significantly different at $P \leq 0.01$

III: *Back fat thickness according to weight interval of pigs fattened on slatted floor pens and deep-bedded pens*

Weight interval	Fattening on slatted floor pen			Fattening on deep-bedden pen		
	n	Slaughter weight (kg) x	Back fat thickness (mm) $x \pm s_x$	n	Slaughter weight (kg) x	Back fat thickness (mm) $x \pm s_x$
Under 80	6	78.68	9.87 ± 2.83	1	78.61	7.2 ± 0.00
80–89.9	33	84.44	11.8 ± 3.80	16	86.14	12.41 ± 2.60
90–99.9	65	94.37	13.16 ± 5.80	33	96.06	14.03 ± 3.79
100–109.9	95	105.22	14.38 ± 5.18	54	104.88	16.02 ± 4.32
110–119.9	96	114.34	15.29 ± 4.96	60	114.32	16.28 ± 4.60
120–129.9	62	123.67	14.88^{A} ± 3.60	70	124.55	18.06^{B} ± 4.48
130–139.9	48	134.66	15.79^{A} ± 3.88	56	134.74	18.65^{B} ± 3.89
140 and more	12	143.05	14.74^{a} ± 5.43	26	144.53	18.65^{b} ± 3.91

x: mean; s_x: standard deviation
a,b: means with different superscripts are significantly different at $P \leq 0.05$
A,B: means with different superscripts are significantly different at $P \leq 0.01$

IV: *Muscle deep (mm) according to weight interval of pigs fattened on slatted floor pens and deep-bedded pens*

Weight interval (kg)	Fattening on slatted floor pen			Fattening on deep-bedden pen		
	n	Slaughter weight (kg) x	Muscle deep (mm) $x \pm s_x$	n	Slaughter weight (kg) x	Muscle deep (mm) $x \pm s_x$
Under 80	6	78.68	45.55 ± 6.20	1	78.61	58.3 ± 0.00
80–89.9	33	84.44	47.15 ± 9.38	16	86.14	49.78 ± 5.37
90–99.9	65	94.37	51.77 ± 7.71	33	96.06	55.15 ± 7.03
100–109.9	95	105.22	53.66 ± 7.34	54	104.88	56.31 ± 7.68
110–119.9	96	114.34	58.51 ± 7.94	60	114.32	60.59 ± 8.82
120–129.9	62	123.67	61.69 ± 9.10	70	124.55	64.31 ± 8.30
130–139.9	48	134.66	64.17 ± 6.96	56	134.74	66.15 ± 9.00
140 and more	12	143.05	68.29 ± 6.53	26	144.53	69.72 ± 6.25

x: mean; s_x: standard deviation

V: *Lean meat portion (%) according to weight interval of pigs fattened on slatted floor pens and deep-bedded pens*

Weight interval	Fattening on slatted floor pen			Fattening on deep-bedden pen		
	n	Slaughter weight (kg) x	Lean meat portion (%) $x \pm s_x$	n	Slaughter weight (kg) x	Lean meat portion (%) $x \pm s_x$
Under 80	6	78.68	60.03 ± 2.05	1	78.61	62.1 ± 0.00
80–89.9	33	84.44	58.74 ± 2.73	16	86.14	58.37 ± 1.83
90–99.9	65	94.37	57.88 ± 4.11	33	96.06	57.33 ± 2.64
100–109.9	95	105.22	57.06 ± 3.70	54	104.88	55.97 ± 3.05
110–119.9	96	114.34	56.52 ± 3.52	60	114.32	55.87 ± 3.22
120–129.9	62	123.67	56.88^{A} ± 2.50	70	124.55	54.71^{B} ± 3.13
130–139.9	48	134.66	56.28^{A} ± 2.73	56	134.74	54.33^{B} ± 2.73
140 and more	12	143.05	56.52^{a} ± 2.78	26	144.53	54.39^{b} ± 2.70

x: mean; s_x: standard deviation
a,b: means with different superscripts are significantly different at $P \leq 0.05$
A,B: means with different superscripts are significantly different at $P \leq 0.01$

weight group with range 110–119.9 kg (average 114.32 kg) and price 33.51 Kč. Contrarily the lowest price per 1 kg (28.16 Kč respectively 28.00 Kč) was determined identically in pigs bred on slatted floor pens and pigs bred on deep-bedded pens – these slaughter pigs had more than 140 kg. The most valued pigs (both – from slatted floor pens and deep-bedded pens) were from weight range from 90 till 129.9 kg of slaughter weight. Pigs with slaughter weight under 90 kg or more than 130 kg reached markedly lower price per 1 kg of slaughter weight.

Higher slaughter weight in all business classes SEUROP (with exception of class S) was reached by pigs which were fattened on deep-bedded pens compared to pigs fattened on slatted floor pens. In pigs which were fattened on slatted floor pens and were classified into business class S an average slaughter weight was 100.75 kg. In pigs which were fattened on deep-bedded pens it was 92.81 kg. This difference was statistically conclusive on a level of importance $P \leq 0.05$.

Very high statistical conclusive difference $P \leq 0.01$ was determined in business class U when in pigs fattened on slatted floor pens an average slaughter weight was determined at 110.32 kg compared to pigs fattened on deep-bedded pens with 122.68 kg. In other business classes R and O slaughter weight of pigs fattened on deep-bedded pens was markedly higher compared to pigs fattened on slatted floor pens. Identically as slaughter weight, back fat thickness was growing with decreasing lean meat percentage. In all business classes SEUROP (with exception of class R) measured values of back fat thickness in pigs from deep-bedded pens were higher in comparison with pigs from slatted floor pens. In class S an average back fat thickness was 8.57 mm in pigs on slatted floor pens and 9.15 mm in pigs on deep-bedded pens litter – this difference was statistically conclusive $P \leq 0.05$. In class E statistical conclusive difference was determined ($P \leq 0.05$), when average back fat thickness in pigs on slatted floor pens was 13.66 mm and in pigs on deep-bedded pens 14.19 mm. Surprisingly higher average back fat thickness (28.55 mm) was determined in business class R in pigs fattened on slatted floor pens in comparison with pigs fattened on deep-bedded pens litter with 27.72 mm.

Statistical conclusive differences $P \leq 0.05$ respectively $P \leq 0.01$ were determined in average lean meat percentage in business classes S and E between pigs fattened on slatted floor pens compared to pigs on deep-bedded pens. In pigs on slatted floor pens an average lean meat percentage in business class S was on a level of 61.15% in comparison with pigs on deep-bedded pens with 60.67%. In business class E there was higher value of average lean meat percentage (57.63%) determined in pigs on grates in comparison with pigs on deep-bedded pens with 57.34%. According to David *et al.* (2016) slaughter pigs with higher lean meat portion in carcass modified body over 57.5% are advantaged with price. With growing lean meat percentage the price is growing up to 104% of basic price. According to Pulkrábek *et al.* (2015) carcass value expressed by lean meat percentage has the biggest influence on price of carcass pigs.

Higher average price (32.86 Kč) per 1 kg of slaughter weight was determined in pigs classified into business class E, then into business class S (32.41 Kč), business class U (30.74 Kč) and the lowest price per 1 kg (26.30 Kč) was in pigs in class O.

It is obvious that for 1 kg of slaughter weight in all business classes SEUROP the higher price was in pigs fattened on deep-bedded pens compared to pigs from slatted floor pens. The highest prices (33.33 Kč respectively 32.50 Kč) per 1 kg of slaughter weight in pigs fattened on deep-bedded pens and pigs fattened on slatted floor pens were determined in business class E. This difference was statistically conclusive $P \leq 0.01$. The lowest prices per 1 kg of slaughter weight were determined in business classes O with pigs with the lowest percentage of lean meat.

VI: *Price per 1 kg of slaughter weight (Kč) according to weight interval of pigs fattened on slatted floor pens and deep-bedded pens*

Weight interval	Fattening on slatted floor pen			Fattening on deep-bedden pen		
	n	Slaughter weight x	Price per 1 kg of slaughter weight (Kč) $x \pm s_x$	n	Slaughter weight x	Price per 1 kg of slaughter weight (Kč) $x \pm s_x$
Under 80	6	78.68	29.92 ± 1.44	1	78.61	30.80 ± 0.00
80–89.9	33	84.44	29.29^{a} ± 1.95	16	86.14	30.65^{b} ± 2.02
90–99.9	65	94.37	31.48^{A} ± 1.88	33	96.06	32.83^{B} ± 1.90
100–109.9	95	105.22	32.71 ± 1.92	54	104.88	33.36 ± 2.04
110–119.9	96	114.34	32.53^{A} ± 1.84	60	114.32	33.51^{B} ± 2.07
120–129.9	62	123.67	33.00 ± 1.37	70	124.55	32.81 ± 1.80
130–139.9	48	134.66	30.84 ± 1.91	56	134.74	30.66 ± 1.91
140 and more	12	143.05	28.16 ± 1.73	26	144.53	28.00 ± 1.51

x: mean; s_x: standard deviation
a,b: means with different superscripts are significantly different at $P \leq 0.05$
A,B: means with different superscripts are significantly different at $P \leq 0.01$

VII: *Slaughter weight according to SEUROP classification in pigs fattened on slatted floor pens and on deep-bedded pens*

Business class and lean meat percentage %	Fattening on slatted floor pen			Fattening on deep-bedden pen		
	n	%	Slaughter weight (kg) $\bar{x} \pm s_x$	n	%	Slaughter weight (kg) $\bar{x} \pm s_x$
S (60 and more)	90	21.6	$100.75^{a} \pm 13.36$	12	3.80	$92.81^{b} \pm 8.10$
E (55–59.9)	223	53.5	114.91 ± 15.85	175	55.4	115.44 ± 15.66
U (50–54.9)	90	21.6	$110.32^{A} \pm 13.68$	113	35.8	$122.68^{B} \pm 14.86$
R (45–49.9)	13	3.1	113.33 ± 15.41	14	4.4	123.8 ± 14.27
O (40–44.9)	1	0.2	118.49 ± 0.00	2	0.6	121.47 ± 2.79

x: mean; s_x: standard deviation
a,b: means with different superscripts are significantly different at $P \leq 0.05$
A,B: means with different superscripts are significantly different at $P \leq 0.01$

VIII: *Back fat thickness according to SEUROP classification in pigs fattened on slatted floor pens and on deep-bedded pens*

Business class and lean meat percentage %	Fattening on slatted floor pen			Fattening on deep-bedden pen		
	n	%	Back fat thickness (mm) $\bar{x} \pm s_x$	n	%	Back fat thickness (mm) $\bar{x} \pm s_x$
S (60 and more)	90	21.6	$8.57^{a} \pm 2.07$	12	3.80	$9.15^{b} \pm 0.96$
E (55–59.9)	223	53.5	$13.66^{a} \pm 0.86$	175	55.4	$14.19^{b} \pm 1.96$
U (50–54.9)	90	21.6	19.70 ± 1.84	113	35.8	19.96 ± 2.01
R (45–49.9)	13	3.1	28.55 ± 1.58	14	4.4	27.72 ± 2.35
O (40–44.9)	1	0.2	32.20 0.00	2	0.6	33.85 ± 2.76

x: mean; s_x: standard deviation
a,b: means with different superscripts are significantly different at $P \leq 0.05$

IX: *Lean meat portion according to SEUROP classification in pigs fattened on slatted floor pens and on deep-bedded pens*

Business class and lean meat percentage %	Fattening on slatted floor pen			Fattening on deep-bedden pen		
	n	%	Lean meat portion (%) $\bar{x} \pm s_x$	n	%	Lean meat portion (%) $\bar{x} \pm s_x$
S (60 and more)	90	21.6	61.15^{A} 0.57	12	3.80	$60.67^{B} \pm 0.69$
E (55–59.9)	223	53.5	$57.63^{a} \pm 1.32$	175	55.4	$57.34^{b} \pm 1.32$
U (50–54.9)	90	21.6	53.35 ± 1.28	113	35.8	53.35 ± 1.40
R (45–49.9)	13	3.1	47.04 ± 1.24	14	4.4	47.90 ± 1.70
O (40–44.9)	1	0.2	44.50 ± 0.00	2	0.6	43.50 ± 1.84

x: mean; s_x: standard deviation
a,b: means with different superscripts are significantly different at $P \leq 0.05$
A,B: means with different superscripts are significantly different at $P \leq 0.01$

X: *Price per 1 kg of slaughter weight according to SEUROP classification in pigs fattened on slatted floor pens and on deep-bedded pens*

Business class and lean meat percentage %	Fattening on slatted floor pen			Fattening on deep-bedden pen		
	n	%	Price per 1 kg of slaughter weight (Kč) $\bar{x} \pm s_x$	n	%	Price per 1 kg of slaughter weight (Kč) $\bar{x} \pm s_x$
S (60 and more)	90	21.6	32.38 ± 1.82	12	3.80	32.63 ± 2.13
E (55–59.9)	223	53.5	$32.50^{A} \pm 1.89$	175	55.4	$33.33^{B} \pm 2.01$
U (50–54.9)	90	21.6	30.56 ± 1.73	113	35.8	30.89 ± 1.92
R (45–49.9)	13	3.1	26.85 ± 1.19	14	4.4	27.94 ± 2.31
O (40–44.9)	1	0.2	25.92 ± 0.00	2	0.6	26.49 ± 0.34

x: mean; s_x: standard deviation
A,B: means with different superscripts are significantly different at $P \leq 0.01$

Very highly conclusive P ≤ 0.001 medium positive correlation r = 0.5736 was determined between slaughter weight and muscle deep. Lower value (r = 0.3692) is mentioned by Sládek *et al.* (2003). Low negative correlation r = –0.2040, very highly conclusive P ≤ 0.001, was determined between slaughter weight and lean meat portion. Almost the same correlation (r = –0.2996) between slaughter weight and lean meat portion was determined by Sládek *et al.* (2003).

Very high negative correlation r = –0.9941 was determined between back fat thickness and lean meat portion. Kernerová *et al.* (2000) determined in their study coefficient of correlation r = -0.91 between back fat thickness and lean meat portion too. Mrode and Kennedy (1993) mention correlation r = -0.87 between back fat thickness and lean meat portion.

Very highly conclusive P≤0.001 positive correlation 0.2263 was determined between slaughter weight and back fat thickness. Very highly conclusive P≤0.001 positive correlation 0.2562 was determined between muscle deep and price per 1 kg of slaughter weight. Very highly conclusive P≤0.001 medium positive correlation 0.5207 was between lean meat portion and price per 1 kg slaughter weight. Very highly conclusive P≤0.001 medium negative correlation – 0.5044 was between back fat thickness and price per 1 kg of slaughter weight.

XI: *Tab 11: Determined correlation coefficients among chosen traits*

Trait	Muscle deep (mm)	Back fat thickness (mm)	Lean meat portion (%)	Price per 1 kg of slaughter weight (Kč)
Slaughter weight (kg)	0.5736***	0.2263***	–0.2040***	0.0790
Muscle deep (mm)		–0.1429**	0.1844***	0.2562***
Back fat thickness (mm)			–0.9941***	–0.5044***
Lean meat portion (%)				0.5207***

** P ≤ 0.01
*** P ≤ 0.001

CONCLUSION

From reached results it is possible to pronounce that the highest number of slaughtered pigs were in weight range 110–119.9 kg of slaughter weight with an average weight 114.34 kg. Values of back fat thickness had increasing tendency with growing slaughter weight compared to lean meat percentage with linearly decreasing tendency.

Slaughter pigs fattened on deep-bedded pens had higher slaughter weight for approximately 7 kg in comparison with pigs fattened on slatted floor pens. Pigs on deep-bedded pens in comparison with pigs on slatted floor pens reached higher back fat thickness, higher muscle deep, higher price per 1 kg of slaughter weight, but on the contrary had lower lean meat percentage for approximately 1.58% which corresponds with higher slaughter weight.

In all weight categories a higher lean meat portion was found in carcass pigs fattened on slatted floor pens in comparison with pigs which were fattened on deep-bedded pens.

The highest number of slaughter pigs 54.3% was classified into business class E with 57.51% of lean meat, 115.15 kg of average slaughter weight at average price 32.86 Kč per 1 kg of slaughter weight. From experiment it is obvious that for 1 kg of slaughter weight in all business classes SEUROP higher price was in pigs fattened on deep-bedded pens in comparison with pigs fattened on slatted floor pens. The highest prices per 1 kg of slaughtered weight were found in business class E in both groups of tested pigs.

REFERENCES

BOLAND, M. A., FOSTER, K. A, PRECKEL, P. V. and SCHINCKEL, A. P. 1996. Analyzing pork carcass evaluation technologies in a swine bioeconomic model. *J. Prod Agric.*, 9(1): 45–49.

BRANSCHEID, W., JUDAS, M. and HÖRETH, R. 2011. Clasification of pig carcasses: new estimation fomulas and new grading apparatuses. *Fleischwirtschaft*, 91: 106–111.

CÁMARA, L., BERROCOSO, J. D., COMA, J., LÓPEZ-BOTE, J. and MATEOS, G. G. 2016. Growth performance and carcass quality of crossbreds pigs from two Pietrain sire lines fed isoproteic diets varying in energy concentration. *Meat Sci.*, 114: 69–74.

CONTE, S., BOYLE, L. A., O'CONNELL, N. E., LYNCH, P. B. and LAWLOR, P. G. 2011. Effect of target slaughter weight on production efficiency, carcass traits and behaviour of restrictively-fed gilts and intact male finisher pigs. *Livestock Sci.*, 136(2–3): 169–174.

CORREA, J. A, FAUCITANO, L., LAFOREST, J. P, RIVEST, J., MARCOUX, M. and GARIÉPY, C. 2006. Effects of slaughter weight on carcass composition and meat quality in pigs of two different growth rates. *Meat Sci.*, 72(1): 91–99.

CZYŻAK-RUNOWSKA, G., WOJTCZAK, J., ŁYCZYŃSKI, A., WÓJTOWSKI, J., MARKIEWICZ-KĘSZYCKA, M., STANISŁAWSKI, D. and BABICZ, M., 2015. Meat quality of crossbred porkers without the gene RYR1T Depending on slaughter weight. Asian Australas. *J. Anim. Sci*., 28(3): 398–404.

ČANDEK-POTOKAR, M., ŽLENDER, B. and BONNEAU, M. 1998. Effects of breed and slaughter weight on *longissimus* muscle biochemical traits and sensory quality in pigs *Ann. Zootech*., 47(1): 3–16.

DAVID, L., PULKRÁBEK, J. and VALIŠ, L. 2016. Realisation of pig carcasses in Czech republic, *Research in pig breeding*, 10(2): 5–9.

GARDZIŃSKA, A., MIGDAŁ, W., WANTUŁA, M. and STAWARZ, M. 2002: Wartość tuczna i rzeźna tuczników pbz × (duroc × pietrain) o różnej masie ciała w dniu uboju. *Pr. i Mat. Zoot., Zesz. Spec*., 13: 49–53.

GLINOUBOL, J., JATURASITHA, S., MAHINCHAIB, P., WICKE, M. and KREUZER, M. 2015. Effects of Crossbreeding Thai Native or Duroc Pigs with Pietrain Pigs on Carcass and Meat Quality. *Agriculture and Agricultural Science Procedia*, 5: 133–138.

KERNEROVÁ, N., MATOUŠEK, V. and NOVOTNÝ, F. 2000. Dopad šlechtění na úroveň masné užitkovosti u finálních hybridů. In: *Sborník tezí přednášek z mezinárodní konference XIX. Genetické dny.* České Budějovice.

LATORRE, M. A., LAZARO, R., VALENCIA, D. G, MEDEL, P. and MATEOS, G. G. 2004. The effects of gender and slaughter weight on the growth performance, carcass traits, and meat quality characteristics of heavy pigs. *J. Anim. Sci*., 82(2): 526–533.

LUCAS, D., BRUN, A., GISPERT, M., CARABÚS, A., SOLER, J., TIBAU, J. and FONT-I-FURNOLS, M. 2017. Relationship between pig carcass characteristics measured in live pigs or carcasses with Piglog, Fat-o-Meat'er and computed tomography. *Livestock Sci*., (197): 88–95.

MRODE, R. A. and KENNEDY, B. W. 1993. Genetic variation inmeasures of food efficiency in pigs and their genetic relationships with growth rate and backfat. *Anim. Prod*., 56(2): 225–232.

OLIVEIRA, E. A., BERTOL, T. M., COLDEBELA, A., SANTOS FILHO, J. I., SCANDOLERA, A. J. and WARPECHOWSKI, M. B. 2015. Live performance, carcass quality, and economic assessment of over 100kg slaughtered pigs. *Arquivo Brasileiro de Medicina Veterinaria e Zootecnia*, 67(6): 1743–1750.

PEINADO, J., MEDEL, P., FUENTETAJA, A. and MATEOS, G. G. 2008. Meat quality of heavy pigs destined for the dry-cured industry influence of sex and castration of females on growth performance and carcass and. *J. Anim. Sci*., 86(6): 1410–1417.

PULKRÁBEK, J. 2001. Zajištění objektivního zpeněžování prasat systémem SEUROP – kontrolní mechanizmy. In: *Aktuální problémy chovu prasat*, pp. 14–20.

PULKRÁBEK, J. and PAVLÍK, J. 2000. Možnosti podstatného zvyšování podílu svaloviny u prasat po otcích specializovaných populací. In: *Sborník tezí přednášek z mezinárodní konference XIX. Genetické dny.* České Budějovice.

PULKRÁBEK, J., DAVID, L. and VALIŠ, L. 2015. Carcass composition in selected pig hybrids in Czech republic, *Research in pig breeding*, 9(1): 10–15.

RUUSUNEN, M., PUOLANNE, E., SEVON-AIMONEN, M. L., PARTANEN, K., VOUTILA, L. and NIEMI, J. 2012. Carcass and meat quality traits of four different pig crosses. *Meat Sci*., 90(3): 543–547.

SENCIC, D., ANTUNOVIC, Z., KANISEK, J. and SPERANDA, M. 2005. Fattening, meatness and economic efficiency of fattening pigs. *Acta Veterinaria Beograd*., 55(4): 327–334.

SIECZKOWSKA, H., KOĆWIN-PODSIADŁA, M., KRZĘCIO, E., ANTOSIK, K. and ZYBERT, A. 2008. Mięsność i skład morfologiczny tuszy tuczników mieszańców (landrace × yorkshire) × duroc i (landrace × yorkshire) × (duroc × pietrain). *Rocz. Nauk. PTZ*, 4(3): 279–287.

SLÁDEK, L., ČECHOVÁ, M. and MIKULE, V. 2003. Carcass value of tested hybrid pig combination slaughter in different slaughter weight. *Acta Univ. Agric. et Silvic. Mendel. Brunen*., 51(5): 71–78.

STEGE, H., JENSEN, T. B., BAGGER, J., KELLER, F., NIELSEN, J. P. and ERSBØLL, A. K. 2011. Association between lean meat percentage and average daily weight gain in Danish slaughter pigs, *Preventive Veterinary Medicine*, 101(1–2): 121–123.

SUZUKI, K., SHIBATA, H., KADOWAKI, H., ABE, H. and TOYOSHIMA, T. 2003. Meat quality comparison of Berkshire, Duroc and crossbred pigs sired by Berkshire and Duroc. *Meat Science*, 64(1): 35–42.

SVOBODA, V. 2001. Praktický dopad zatřiďování jatečných půlek prasat a faktory, ovlivňující zmasilost. In: *Aktuální problémy chovu prasat*, pp. 59–64.

VÁCLAVKOVÁ, E. and BEČKOVÁ, R. 2009. Carcass value and meat fatty acid composition of fattening gilts and barrows. *Research in pig breeding*, 3(2): 36–39.

WÄHNER, M. 2002. Současné problémy a tendence ve vývoji chovu prasat. In: *Chov prasat na prahu 3. tisíciletí*. Kostelec nad Orlicí, pp. 12–19.

ZYBERT, A., KOĆWIN-PODSIADŁA, M. and KRZĘCIO, E. 2001: The influence of hot carcass weight on quantitative traits and lean meat content estimated according to method using in Polish Pig Testing Stations. *Pol. J. Food Nutr. Sci*., 51(3-S): 252–255.

Contact information

Libor Sládek: sladek@mendelu.cz