

EFFECT OF THE SLAUGHTER WEIGHT ON BASIC CHEMICAL COMPOSITION OF PORK

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Abstract

The objective of this work was to verify an effect of slaughter weight on basic chemical composition of major pork meat parts. 120 slaughter pigs of a final hybrid combination commonly used in the Czech Republic were used in the test. Pigs were sorted in 4 groups according to their live weight. Representative muscle samples were taken from the right halves of these pigs, which were homogenized and submitted for chemical analysis. In the frame of consideration of the relation between the weight groups of all controlled parameters, then statistically significant differences have been found ($P \leq 0.05$, 0.01 resp. 0.001) at the water content, IMF, as well as the crude proteins and ash matters.

Introduction

The consumers' interest in pork and pork products is maintained and originated upon many factors. Composition of pork and thereby its nutrition value, sensoric perception, especially its fine taste, softness, crispness and juiciness plus variety of culinary preparations may serve as the examples (Lamb, 1994).

As presented by Wood et al. (1994), Jeleníková (2003), a consumer considers meat having an optimum composition regarding its nutritious value to be a quality meat. Meat is a very rich and universal source of nutrients (Ruprich, 2003). Primary importance of meat is based in protein content especially (Jedlička, 1988, Lawrie, 1998,).

Gonzalez et al. (2001), Tibau et al. (2002) studied chemical composition of pork in relation to slaughter value, sex and genotype. Chemical composition of pork was analyzed in final hybrids of slaughtered animals in weight interval between 25 and 140 kg body weight.

Franci et al. (1993) monitored physical and chemical composition of three muscles (*m. biceps femoris*, *m. semimembranosus* and *m. semitendinosus*) of 5 hog breeds (LW, L, BL, D and Sienna).

As presented by Fortin (1982), slaughter weight influences its chemical composition more than physical indicators. These conclusions are confirmed by tests by Holková, Bečková (1993) and Bečková (1996), in which percentage of IMF in 78 final hybrids with a view to various slaughter weight were monitored. Poltársky, Palanská (1991), Mikule (2005) studied the optimum slaughter weight influencing the basic chemical composition of meat, who also confirm conclusions presented above.

Material and methods

The objective of this work was to verify an effect of slaughter weight on basic chemical composition of major meaty parts of pork.

The tests were realized at the test-station Ploskov. All pigs were penned pairly and divided according to sex (barrow/gilt).

The pigs were placed into the test at the average live weight of 23.6 kg (the same age and well-balanced sex ratio - barrows /gilts) and at the average age of 65 to 70 days after the date of birth.

The feeding was carried out by means of full feeding mixture (FFM), which contained three components (wheat, barley, soybean extracted meal) and feeding premix. Pigs were after the attainment of the overall average live weight 111.6 kg in the age of 168-171 days from the birth killed and subjected to the carcass analysis.

The right half-carcass was dissected into individual parts. Samples were taken from the main meaty parts – neck (*musculus serratus ventralis*), chop (*musculus longissimus lumborum et thoracis*), shoulder (*musculus cleidocephalicus*) and ham (*musculus semimembranosus*).

The representative ones were homogenized and subjected to chemical analyses to determine content of water, intramuscular fat, crude proteins and ashes.

120 finishing pigs were divided into 4 groups according to the live weight (Table 1).

The obtained test results were evaluated by the statistical programme SAS[®] Proprietary Software Release 6.04, formulated in tables, whereas the differences between the individual traits were tested by GLM procedure on mutual interactions between live weight.

Results and discussion

Results of the basic chemical analyses are presented in the tables 2, 3, 4 and 5.

The table 2 characterizes contents of water in relation to live weight in major meaty parts of pork. The highest average water value was found in the shoulder, in particular of 76.27 % in the group up to 100 kg live weight. Contrary to that, the lowest average value was achieved by the neck, in particular of 67.15 % in the group with live weight 120.1 kg and more. In this regard Ševčíková et al. (2002) mention in the hybrid combination LWxL and NLxL with the average live weight 114 kg an interval 73.58 % and 74.27 %.

Table 1: Sorting 4 groups according to the sorting criterion of live weight.

Live weight (kg)	$\bar{x} \pm SD$	N
up to 100 kg	91,2 ± 1,84	18
100.1 - 110 kg	104.8 ± 0.42	47
110.1 - 120 kg	114.5 ± 0.47	34
120.1 kg and more	128.8 ± 1.43	21

Table 2. Contents of water in relation to live weight in major meaty parts of pork.

Live weight (kg)	Neck (kg)	Ham (kg)	Chop (kg)	Shoulder (kg)
	$\bar{x} \pm SD$	$\bar{x} \pm SD$	$\bar{x} \pm SD$	$\bar{x} \pm SD$
up to 100 kg	70.53 ^A ± 0.47	71.01 ± 0.43	73.39 ^{aa} ± 0.30	76.27 ^{ABa} ± 0.48
100.1 - 110 kg	71.09 ^{Ba} ± 0.30	70.84 ^a ± 0.21	72.09 ^a ± 0.23	72.89 ^{Ab} ± 0.31
110.1 - 120 kg	69.77 ^{Ca} ± 0.36	71.43 ± 0.22	72.37 ^a ± 0.27	73.61 ^B ± 0.30
120.1 kg and more	67.15 ^{ABC} ± 0.35	71.89 ^a ± 0.26	72.71 ± 0.44	74.27 ^{ab} ± 0.34

^{ABC}*P* £0.05; ^{ab}*P* £0.01; ^a*P* £0.001

The established percentage of intramuscular fat (IMF) was different for each group and part of meat. The highest IMF presence, as shown in the table 3, was in the group with live weight 120.1 kg and more (neck, 12.41 %) and the lowest IMF content was in the group with live weight up to 100 kg (chop, 1.58 %). The group with live weight up to 100 kg showed average values of IMF content in the interval between 8.69 % (neck) and 1.88 % (chop). The group 100.1 – 110 kg live weight had the average IMF values in the interval between 6.81 % (neck) and 1.73 % (chop). In the group 110.1 – 120 kg live weight, the average values fluctuated between 9.02 % (neck) and 1.58 % (chop) and group 120.1 kg and more live weight had average values in the interval between 12.41 % (neck) and 1.85 % (chop). Matoušek et al. (1997) found out in hybrid population of hogs 2.39% share of intramuscular fat. Bejerholm and Barton Gade (1986), present optimum value for intramuscular fat in the longest back muscle 2.5 %. As stated by Mikule et al. (2000) the average content of intramuscular fat in the monitored hog breed in the Czech Republic was between 1.02 – 1.94 %.

The average values of crude proteins are presented in the table 4. According to Pipek and Pour (1998), the content of proteins in clean lean meat uses to be between 18 and 22 %.

The highest average values of crude proteins were assessed in the group with 110.1 -120 kg live weight (chop, 23.63 %) and the lowest average values were showed by the group with live weight 120.1 kg and more (neck, 18.82 %). In this regard Correa et al. (2006) obtained similar results of crude proteins content, resp. in the range 23.30 – 23.80 %, when the highest values were in the group of animals with the average live weight 115 kg. Also Ševčíková et al. (2002) mention 23.11 % and 22.71 % crude proteins.

The content of ashes as listed in the table 5 again showed different interval values. The highest values (1.68 %, ham) were shown out in the group with the live weight up to 100 kg, the lowest (0.99 %, shoulder) then in the group with live weight up to 100 kg. According to Arnoštové et al. (2000), the values of ashes content reached in average an interval between 0.95 and 1.23 %. Also Lagin et al. (2002), presents lower values of ashes in the part of roast meat in hybrids (Seghers – 1.12 %, Kahyb – 1.14 %, Slovhyb 2 – 1.15%).

In the frame of statistical evaluation of differences between the groups the values of water content, IMF, crude proteins and ash matters were highly significant (*P* ≤ 0.05; *P* ≤ 0.01 and *P* ≤ 0.001).

Table 3. IMF contents in relation to live weight in major meaty parts of pork.

Live weight (kg)	Neck (kg)	Ham (kg)	Chop (kg)	Shoulder (kg)
	$\bar{x} \pm SD$	$\bar{x} \pm SD$	$\bar{x} \pm SD$	$\bar{x} \pm SD$
up to 100 kg	8.69 ^{Aa} \pm 0.59	3.60 \pm 0.23	1.88 \pm 0.13	2.59 ^{ABC} \pm 0.16
100.1 - 110 kg	6.81 ^{BCa} \pm 0.37	3.76 \pm 0.17	1.73 \pm 0.08	4.08 ^A \pm 0.17
110.1 - 120 kg	9.02 ^{BD} \pm 0.55	3.78 \pm 0.17	1.58 \pm 0.08	3.88 ^B \pm 0.18
120.1 kg and more	12.41 ^{ACD} \pm 0.51	4.26 \pm 0.29	1.85 \pm 0.14	3.76 ^C \pm 0.18

^{ABCD} $P < 0.05$; ^a $P < 0.001$

Table 4. Crude proteins content in relation to live weight in major meaty parts of pork.

Live weight (kg)	Neck (kg)	Ham (kg)	Chop (kg)	Shoulder (kg)
	$\bar{x} \pm SD$	$\bar{x} \pm SD$	$\bar{x} \pm SD$	$\bar{x} \pm SD$
up to 100 kg	19.84 ^A \pm 0.18	21.86 \pm 0.21	22.34 ^{ABC} \pm 0.20	19.19 ^{AB} ^a \pm 0.27
100.1 - 110 kg	20.24 ^B ^a \pm 0.13	21.97 \pm 0.10	23.33 ^A \pm 0.12	20.28 ^A \pm 0.14
110.1 - 120 kg	19.64 ^{Ca} \pm 0.16	21.89 \pm 0.15	23.63 ^B \pm 0.11	20.29 ^B \pm 0.17
120.1 kg and more	18.82 ^{ABC} ^c \pm 0.21	21.59 \pm 0.22	23.26 ^C \pm 0.21	20.05 ^a \pm 0.25

^{ABC} $P < 0.05$; ^a $P < 0.01$; ^a $P < 0.001$

Table 5. Ash contents in relation to live weight in major meaty parts of pork.

Live weight (kg)	Neck (kg)	Ham (kg)	Chop (kg)	Shoulder (kg)
	$\bar{x} \pm SD$	$\bar{x} \pm SD$	$\bar{x} \pm SD$	$\bar{x} \pm SD$
up to 100 kg	1.18 ^A \pm 0.35	1.68 ^{ABa} \pm 0.07	1.42 \pm 0.06	0.99 ^{AB} \pm 0.04
100.1 - 110 kg	1.18 ^B \pm 0.02	1.45 ^A \pm 0.03	1.37 \pm 0.02	1.19 ^{Aa} \pm 0.02
110.1 - 120 kg	1.18 ^C \pm 0.02	1.48 ^a \pm 0.03	1.35 \pm 0.02	1.19 ^{Bb} \pm 0.02
120.1 kg and more	1.04 ^{ABC} \pm 0.02	1.38 ^B \pm 0.05	1.42 \pm 0.03	1.07 ^{ab} \pm 0.04

^{ABC} $P < 0.05$; ^{ab} $P < 0.01$

Conclusion

On the base of obtained results of measurements it can be documented that

- the highest/lowest values of water content were in the group up to 100 kg (shoulder)/120.1 kg (neck) and more of live weight,
- the highest content of IMF had the part of neck in the group 120.1 kg and more live weight (12.41 %), contrary to that the lowest content was in the part of chop (1.58 %) in the group 110.1 -120 kg live weight,
- the higher live weight, the higher the IMF content, crude protein content ranged at neck/ham/chop/shoulder in the interval 18.82-20.24/ 21.59-21.97/22.26-23.63/19.19-20.29 %,
 - the highest/lowest values of ashes content were obtained in ham/shoulder (1.68/0.99 %) in the group with live weight up to 100 kg.

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The study was supported by MSM 604 607 0901 and NAZV QG60045 grants.