CARCASS VALUE AND MEAT QUALITY IN PIG FINAL HYBRIDS

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Abstract

The set of pig carcasses (n = 192) was analysed as part of the test procedure for final pig hybrids. The carcasses were evaluated according to the method of the carcass analysis applied in the CR (Beneš, 1995). In addition, selected meat quality traits were observed. The average lean meat content determined by the FOM apparatus was 55.46 ± 0.202 % and the average carcass weight 87.62 ± 0.638 kg. The proportion of main meat parts (HMČ – ČR) in quality grades S and R was 52.13 ± 1.047 % and 47.20 ± 0.585 %. The following meat quality parameters were recorded: pH_1, pH_{24}, meat conductivity, meat colour, drip loss and intramuscular fat content (IMT). The average pH_1 determined in the carcasses graded S and R was 6.01 ± 0.165 and 6.43 ± 0.063. The proportion of IMT slightly increased as the lean meat content decreased. The difference between the two extreme grades was 0.61 percent points. All the studied meat parameters indicated a good overall level within the range of observed carcass quality grades.

Key Words: Pig; carcass value; meat quality; SEUROP system

Introduction

Carcass value of pigs is given by a number of quantitative and qualitative parameters characterising carcass and meat quality. The SEUROP classification system used for payment to pig producers is based on classifying carcasses in different quality grades according to their lean meat content. The system satisfactorily evaluates carcasses with respect to the contribution of different parts (VALIŠ et al., 2008). A number of studies were focused on the effects of hybrid combination, gender or slaughter weight on meat quality. ŠIMEK et al. (2004) evaluated pH, colour, drip loss and the proportion of loin intramuscular fat in four final hybrid combinations used in the CR (n = 200). The best results of carcass composition were found in the hybrids sired by H x PN, while the combinations with the breeds D and ČVM used as sires were best in meat quality parameters. BAHELKA et al. (2007) reported the differences in carcass quality and intramuscular fat content as affected by gender and slaughter weight. The content of loin intramuscular fat was significantly higher in barrows than in gilts, while no effect of slaughter weight was found. Quality parameters of meat from pigs slaughtered at 110, 135, and 160 kg of live weight were observed (FISHER et al., 2006). No differences were found for pH but conductivity and drip loss slightly increased in heavier pigs.

Material and Methods

Data of pigs (n = 192) originating from two final hybrid tests performed in 2006 were included in the analysis. Within one batch, at least 100 pigs equally represented by gilts and barrows at least after 5 sires and from 10 dams are tested under the conditions of the test station. The tested hybrids can be moved into the fattening unit in two groups of 50 animals each with genders equally represented. Only healthy and properly developed pigs with the live weight from 20 to 28 kg are selected for the test. The average live weight of pigs at the beginning and end of the test period is 30 and 115 ± 4 kg, respectively.

Forty-five minutes after the animals have been stuck, the lean meat content was determined using the FOM apparatus. In addition, meat quality parameters (pH_1, colour, electric conductivity) were measured in *musculus longissimus lumborum et thoracis* (MLLT) at the last thoracic vertebra 24 h *post mortem*. The measurements were carried out by the apparatuses pH – STAR, OPTO – STAR and LF – STAR manufactured by the Matthäus company. The carcasses were cut according to the method described by BENEŠ (1995). The samples of MLLT were collected to determine drip loss and IMT content. The effect of the quality grade on the results of carcass and meat quality analyses was calculated using the procedures GLM and MEANS of SAS (version 9.1).

Results and Discussion

The average lean meat content determined by the FOM apparatus was 55.46 ± 0.202 %. The average carcass weight was 87.62 ± 0.638 kg.

Table 1 shows the parameters of meat quality. The values of pH_1 and pH_2 tended to increase as the lean meat content in the carcass increased. The average pH_1 was 6.01 ± 0.165 and 6.43 ± 0.063 in grades S and R, respectively. Thus, unlike for grades E, U and R, the average pH_1 measured in S carcasses approached the critical value of 5.8 associated with PSE meat. Significant differences were recorded between the average values of pH_{24} in S and R carcasses. However, the observed pH_1 and pH_{24} did not generally indicate the occurrence of any of meat disorders. The results are in agreement with the study by BUČKA et al. (2006) who measured pH_1 and pH_{24} of MLLT in pig breeds used in Slovakia. They observed the following values of pH_1 and pH_{24}: Slovak Meaty pig 6.28 and 5.59, Yorkshire 6.28 and 5.56, Hampshire 6.32 and 5.55, Duroc 6.35 and 5.60, respectively. ŠIMEK et al. (2004) determined meat quality parameters in four hybrid combinations used in the CR. Compared to our results, the authors found somewhat lower values of pH_1 which were about 5.9.

The electric conductivity of meat (EV_1) measured after slaughter was similar in the carcasses with different quality grades and was on average 3.15 ± 0.056 mS/cm. Significant differences between quality grades S and U or R were found in the electric conductivity measured 24 h *post mortem* (EV_{24}). Enhanced meat quality was observed in the carcasses of lower quality grades. As reported by MÖRLEIN (2007), the average EV_{24} of 105 pigs was 4.14 mS/cm which is lower than that found in our study (4.30 ± 0.189 mS/cm). FISCHER et al. (2006) observed EV_{24} in pigs slaughtered at 110, 135, and 160 kg 3.64, 3.66, and 4.82 mS/cm. The values of EV found in our study indicate a high level of meat quality.

Meat colour (lightness) measured 45 min *post mortem* significantly differed between the carcasses classified in S and R. The assessment of colour revealed more favourable results in R carcasses. No significant differences were found when the meat colour was measured 24 h *post mortem*. The average value of $lightness_{24}$ was 64.48 ± 0.746. Similar values of $lightness_{24}$ were reported in pigs slaughtered at 110 kg of live weight (FISCHER et al., 2006).

The highest value of drip loss was recorded in S carcasses (3.61 ± 0.454 %), while the average value was 3.25 ± 0.083 %. No significant differences were found between the carcasses of different quality grades. As drip loss values were lower than 5 %, good meat quality of analysed pigs is suggested. The drip loss determined in hybrid pigs in Slovakia by BUČKO et al. (2006) was higher with the average of 5.69 %.

The IMT content slightly increased in the carcasses of lower quality grades. The difference between the two extreme grades was 0.61 percent points. The content of IMT in our study was lower than that found by BAHELKA et al. (2006). They reported the IMT content in the MLLT from gilts and barrows 1.98 and 2.51 %, respectively. In another study involving 129 pigs, the average IMT of gilts and barrows was 2.00 and 2.49 %, respectively (BAHELKA et al., 2007).

It was generally shown that certain differences in meat quality parameters between the carcasses classified in different quality grades exist. Less favourable values were usually observed in S carcasses.

Table 1. Meat quality parameters in different quality grades (n = 192)

Trait	S (n = 6)		E (n = 111)		U (n = 68)		R (n = 7)	
	$\bar{x}$	$s_{\bar{x}}$	$\bar{x}$	$s_{\bar{x}}$	$\bar{x}$	$s_{\bar{x}}$	$\bar{x}$	$s_{\bar{x}}$
pH_1	6.01^a	0.165	6.22^{ab}	0.031	6.34^b	0.033	6.43^b	0.063
pH_{24}	5.52^a	0.027	5.62^{ab}	0.183	5.62^{ab}	0.017	5.69^b	0.040
EV_1 (mS/cm)	3.00^a	0.216	3.19^a	0.077	3.13^a	0.093	2.86^a	0.247
EV_{24} (mS/cm)	6.33^a	1.464	4.41^{ab}	0.246	3.99^b	0.306	3.99^b	1.151
$Colour_1$ (lightness)	80.92^a	3.081	74.59^{ab}	0.941	74.48^{ab}	1.252	64.43^b	5.421
$Colour_{24}$ (lightness)	61.88^a	5.862	63.88^a	0.938	66.29^a	1.258	58.57^a	4.519
Drip loss (%)	3.61^a	0.454	3.30^a	0.114	3.15^a	0.134	3.12^a	0.324
IMT (%)	1.55^a	0.313	1.59^a	0.083	1.74^a	0.093	2.16^a	0.596

^{a,b,c,d} $P \leq 0.05$

The relative contribution of different parts to the whole carcass in different quality grades as well as meat and fat cover proportions of main meat parts (HMČ) is given in Table 2.

The average proportions of HMČ of the whole group, S carcasses, and R carcasses were 50.24 ± 0.185, 52.13 ± 1.047, and 47.20 ± 0.585 %, respectively. No significant differences were recorded between S and E carcasses. Higher proportions of HMČ in gilts (51.89 %) and barrows (51.54 %) were reported previously (MATOUŠEK et al., 2004). The proportion of leg was highest in S carcasses (25.19 ± 0.279 %) and continually decreased in lower quality grades. This decrease was insignificant. The difference between the extreme grades was 0.66 percent points. The average proportion of ham without fat cover (TK) of the carcass weight was 20.72 ± 0.095 %. Significant differences were detected between S and R as well as E and R. The average proportion of neck was 10.85 ± 0.057 %. No clear association between the neck proportion and the carcass lean meat content was observed as the highest neck proportions were found in S and R carcasses (11.23 ± 0.188 and 11.10 ± 0.233 %, respectively). The difference in the proportion of shoulder was significant between S and U carcasses (0.92 percent points). The increasing lean meat content in S, E and U carcasses was associated with a continually decreasing shoulder proportion. However, the proportion of shoulder in R carcasses was higher than in U carcasses by 0.36 percent points. The proportion of loin was lowest in E carcasses (14.09 ± 0.102 %) but the differences between individual quality grades were insignificant. STUPKA (2002) evaluated the proportion of loin of the right side weight. As the lean meat content in different quality grade groups increased, the loin proportion was gradually but insignificantly reduced. In our study, the proportion of belly was significantly higher in S carcasses (17.17 ± 0.278 %) compared to U and R carcasses. It is evident that the proportion of belly is negatively correlated with the overall lean meat content. It is in agreement with STUPKA (2002) who reported the proportion of belly in the group of carcass with the lowest and highest lean meat content 18.66 and 17.47 %, respectively.

Table 2: Proportions of parts and HMČ – ČR of the carcass weight

Part proportion (%)	S (n = 6)		E (n = 111)		U (n = 68)		R (n = 7)	
	$\bar{x}$	$s_{\bar{x}}$	$\bar{x}$	$s_{\bar{x}}$	$\bar{x}$	$s_{\bar{x}}$	$\bar{x}$	$s_{\bar{x}}$
HMČ	52.13^{a}	1.047	50.99^{a}	0.224	49.13^{b}	0.279	47.20^{c}	0.585
Ham	25.19^{a}	0.279	25.13^{a}	0.105	24.92^{a}	0.103	24.53^{a}	0.476
Ham without TK	21.24^{a}	0.313	21.04^{a}	0.123	20.28^{ab}	0.145	19.52^{b}	0.354
TK from ham	3.95^{a}	0.346	4.09^{ab}	0.064	4.64^{bc}	0.096	5.01^{c}	0.185
Sacral bone	0.61^{a}	0.047	0.76^{a}	0.018	0.76^{a}	0.024	0.70^{a}	0.049
Neck	11.23^{a}	0.188	10.86^{a}	0.072	10.78^{a}	0.107	11.10^{a}	0.233
Neck without TK	8.80^{a}	0.308	8.61^{a}	0.065	8.31^{a}	0.082	8.34^{a}	0.195
TK from neck	2.43^{ab}	0.155	2.25^{a}	0.044	2.47^{ab}	0.053	2.76^{b}	0.187
Shoulder	13.16^{a}	0.119	12.54^{ab}	0.088	12.24^{b}	0.123	12.60^{ab}	0.199
Shoulder without TK	10.58^{a}	0.181	10.07^{ab}	0.075	9.54^{b}	0.103	9.46^{b}	0.107
TK from shoulder	2.58^{a}	0.237	2.47^{a}	0.050	2.70^{a}	0.058	3.14^{b}	0.200
Loin	14.47^{a}	0.359	14.09^{a}	0.102	14.52^{a}	0.121	13.70^{a}	0.640
Loin without TK	11.51^{a}	0.409	11.27^{a}	0.090	11.00^{a}	0.074	9.88^{b}	0.436
TK from loin	2.96^{a}	0.284	2.82^{a}	0.055	3.52^{b}	0.085	3.82^{b}	0.283
Belly	17.17^{a}	0.278	18.24^{ab}	0.134	18.62^{b}	0.221	18.75^{b}	0.263
Head	5.43^{a}	0.157	5.27^{a}	0.073	5.07^{a}	0.051	5.36^{a}	0.133
Cheek	3.04^{a}	0.194	3.33^{a}	0.069	3.45^{a}	0.072	3.47^{a}	0.228
Front shank	1.88^{a}	0.159	2.23^{a}	0.042	2.25^{a}	0.051	1.93^{a}	0.125
Front foot	0.97^{a}	0.065	0.89^{ab}	0.009	0.83^{b}	0.009	0.90^{ab}	0.051
Hind shank	3.98^{a}	0.150	3.82^{ab}	0.031	3.65^{b}	0.048	3.74^{ab}	0.076
Hind foot	1.01^{a}	0.030	1.04^{a}	0.012	1.01^{a}	0.018	0.97^{a}	0.019
Groin	1.86^{a}	0.130	1.80^{a}	0.044	1.90^{ab}	0.049	2.25^{b}	0.064

^{a,b,c,d} $P \leq 0.05$ TK - fat cover

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