INFLUENCES WITH AN EFFECT ON A LEVEL OF PH1 OF PORK MEAT IN STUDIED HYBRID PIG COMBINATION (CLW X CL) X (D X BL)

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Abstract

The aim of the study was to evaluate influences with an effect on measured levels of pH_1 in pork and to determine occurrence of PSE meat in carcass pigs (n = 277) of tested hybrid combination (CLW x CL) x (D x BL). An influence of sex, used boars, slaughter weight and lean meat percentage in carcass body on measured values of pH_1 was studied in this experiment. An average value of pH_1 on a level of 6.31 was measured in tested carcass pigs of hybrid combination (CLW x CL) x (D x BL). There were not found statistical conclusive differences between sexes. Higher average value pH_1 6.33 was determined in gilts compared to hogs (6.29).

Defect of pork meat PSE was found in 7.22 % of slaughter pigs only. A little bit higher number of slaughter animals with PSE defect (12 animals) was found in hogs in comparison with gilt (8 animals). There was not statistical conclusive difference between sexes. With growing slaughter weight the values of pH_1 were decreasing. An average value of pH_1 on a level of 6.43 was found in slaughter pigs slaughtered in weight of 80 kg or less, pigs slaughtered in 130 kg and more reached value pH_1 on a level of 6.19. With growing lean meat percentage in carcass body values of pH_1 were growing. The lowest average value 6.13 was determined in pigs with 49.9 – 45.0 of lean meat percentage. On the contrary the highest value of pH_1 6.44 was determined in pigs with 60 and higher lean meat percentage. Statistical conclusive differences among values of pH_1 were found among different business classes according to lean meat percentage.

Key Words: Pigs, hybrid combination, pork meat, lean meat

Modern intensive agricultural production of carcass pigs brought merits in quantity and quality of pork meat. Especially lean meat percentage increased to the detriment of fat.

Some negative influences on pork meat quality accompany production of strongly meat types. It is especially about extensive occurrence of PSE meat (pale, soft, exudative) and DFD meat (dark, firm, dry). These defects occur mostly in pigs of meat type which have genetically conditioned sensitivity to stress (which provokes stress myopathy). One-way oriented selection on high lean meat percentage in carcass pigs brought particular deterioration of meat quality with occurrence of qualitative deviations of PSE and DFD types. For objective evidence of quality deviance PSE of pork meat a measuring of pH_1, measuring of brightness of color by remise and determination of spontaneous drop looses of meat gravy are the most often used methods and criterions from a number of methods (STEINHAUSER et al., 1995).

An importance of pH value lean on an influence on some qualitative meat traits – its color, brittleness, taste, water absorbing, maintaining etc. (WENZLAWOWICZ et al., 1996). WENZLAWOWICZ (1996) declares that pH value is the best for PSE identification in Musculus semimebranosus (MS) and for Musculus longissimus lumborum et thoracis (MLLT) too. According to LENGERKEN et al. (1980) values pH_1 lower than 5.8 are typical for PSE meat.

Meat quality can be affected by breeding - selection of pedigree animals according to stress perceptiveness has an important role. On the other hand environmental factors as farm, animal transport and slaughter house have an influence on meat quality. The highest number of negative influences affect on animals in day of transport and slaughter (BEČKOVÁ, 1997). TERLOUW (2003) mentions stress reactions in animal before its slaughter have a big influence on pork quality.

According to MERKS et al. (2000) influences of genotype, sex, slaughter weight and quality of nourishment on intramuscular fat content and pH are statistical conclusive ($P \leq 0.05$) Loses of meat gravy by dropping and meat color are influenced only by genotype and quality of nourishment.

Material and Methods

The aim of the study was to evaluate influences with an effect on measured levels of pH_1 in pork and to determine occurrence of PSE meat in carcass pigs of tested hybrid combination (CLW x CL) x (D x BL). An influence of sex, used boars, slaughter weight and lean meat percentage in carcass body on measured values of pH_1 was studied in this experiment.

A field test in identical environmental conditions in chosen commercial breeding was done to reach the aims of an experiment. Hybrids F1 generation (CLW x CL)

were used as mothers and they were inseminated by portions of insemination of hybrid boars Duroc x Belgian Landrace from boar station at Velké Meziříčí. Six boars with register marks H13, H14, H15, KRN1, KRN2, KRN3 were used in experiment. After birth the tested piglets were marked individually with number of identification and sex of the animal was recorded to formed database. Fattening of pigs was done separately according to sex in one fattening hall. In the end of fattening 277 of tested pigs were slaughtered in slaughter house at Kostelec u Jihlavy, where a slaughter weight of carcass body was determined and a slaughter weight of animals was counted with a coefficient 1.285. pH_1 in MLLT was measured 45 minutes after slaughter in tested final hybrids.

Next lean meat percentages of carcass bodies were determined. Basic statistical characterizations – an average and standard deviation - were found out from measured values. Student-Newman-Keuls test of multiple comparison of variance analysis was used for difference conclusiveness among different traits. A statistical program UNISTAT 5.1. was used for these purposes.

Results and Discussion

Basic statistical characterizations of qualitative trait of pork pH_1 are shown in table 1. An average value of pH_1 on a level of 6.31 was measured in tested carcass pigs of hybrid combination (CLW x CL) x (D x BL).

There were not found any statistical conclusive differences among sexes. Higher average value 6.33 was determined in gilts in comparison with hogs (6.29). LATORRE et al. (2004), in their study mention that values pH_1 are higher in hogs in comparison with gilts.

KUSEC et al. (2005) measured higher value of pH_1, (6.42) in combination (CLW x L) x (Pn x H). Markedly lower average values in comparison with our study were measured by ŠIMEK et al. (2004) in four studied hybrid combinations. Absolutely identical value of pH_1 5.9 they determined in three combinations, in combination (CLW x L) x (CLW – sire line x BL) they found relatively low average value of pH_1 5.8. SLÁDEK et al. (2000) recorded higher value of pH_1 6.4 in combination (CLW x L) x CLW – sire line.

NOWACHOWICZ et al. (1999) studied meat quality in chosen hybrid combinations and they found higher measured values of pH_1 than in our study in combination (H x PLW) (6.33) and (D x PLW) (6.31). GINEVA (2002) had 7 hybrid combinations of pigs in her experiment and she determined qualitative traits of pork. She measured values of pH_1 in range from 6.1 to 6.3.

BAULAIN et al. (1999) measured an average value of pH_1 6.33 in hybrid combination Duroc x German Landrace.

ČECHOVÁ et al. (1999) evaluated pH_1 in muscle MLLT in pigs of four studied combinations. The highest values were found in pigs of hybrid combination (CLW x L) x (CMP x Pn) (6.01), which is markedly less than in our study.

SLÁDEK et al. (2002) tested three hybrid combination (CLW x L) x CLW – sire line and (CLW x L) x (Pn x H) and (CLW x L) x (CLW – sire line x BL). They found the highest measured value of pH_1 in combination (CLW x L) x CLW – sire line – 6.36, combination (CLW x L) x (Pn x H) followed (6.27) and in combination (CLW x L) x (CLW – sire line x BL) they measured the lowest value - 6.22. GAJEWCZYK et al. (1998) determined lower values of pH_1 (6.03; 6.10 and 6.11) in hybrid combination (Polish Landrace x Polish Large White) x Polish Large White; (Polish Landrace x Polish Large White) x Polish Landrace and (Polish Landrace x Polish Large White) x (Pietrain x Duroc).

NOVÁKOVÁ et al. (2000) measured in ten hybrid combination an average value of pH_1 in range from 5.9 to 6.1.

Because of measured values of pH_1 of pork meat it was possible to find out presence of PSE defect in slaughter animals. According to table 2 it is possible to pronounce that meat of slaughter carcass pigs showed very good meat quality according to values of pH_1.

Table 1. Basic statistical characterizations for trait pH_1 in studied combinations

Combination of hybridization	Sex	n	$\bar{X}$	S_x	X_{min}	X_{max}
(CLW x CL) x (D x BL)	Hogs	159	6.29	0.35	5.54	7.60
	Gilts	118	6.33	0.35	5.53	7.25
	Total	277	6.31	0.35	5.53	7.60

Table 2. Occurrence of PSE defect in studied combinations

Sex	Hogs		Gilts		**Total**	
Combination of hybridization	n	%	n	%	**n**	**%**
(CLW x CL) x (D x BL)	12	7.55	8	6.78	**20**	**7.22**

PSE defect of pork meat was detected only in 7.22 % of slaughter carcass pigs. A little bit higher number of slaughter animals with PSE defect (12 animals) was found in hogs in comparison with gilt (8 animals). There was not statistical conclusive difference between sexes.

SLÁDEK et al. (2002) recorded identical occurrence of PSE defect in combination (CLW x L) x (Pn x H) (7.2 %) and on the contrary markedly lower in combination (CLW x L) x CLW – sire line – 1.5 %.

ŠIMEK et al. (2004) studied quality of pork meat in chosen combinations of commercial pig hybridization and they found out that higher portion of PSE meat (10 %) was reached by hybrid combination (LW x L) x (LW x BL), the lowest occurrence of PSE defect (7.5 %, respective 6.25 %) in combinations (LW x L) x (D x Pn), respective (LW x L) x CMP.

NOVÁKOVÁ et al. (2000) mentions in her study markedly higher occurrence of PSE defect in tested hybrid combinations. The higher occurrence of PSE defect of carcass pigs from ten studied combinations was found in combination (Pc x CLW) x Pn – 42.90 %, in combination (CLW x L) x CLW – sire line it was 11.60 %.

TSOLAKIDI et al. (2004) during measuring of pH_1 in 122 carcass pigs in slaughter house they found 3.29 % animals with PSE defect.

In table 3 there are shown average values of pH_1 determined in offspring after used boars. The highest value of $pH_1$6.45 was measured in offspring after boar KRN 2. On the contrary the lowest value 6.19 was determined in carcass pigs after boar KRN 1. Statistical conclusive difference P≤0.05 in measured values was found between boars KRN 2 and KRN 1 and then between boars H 14 (pH_1 6.40) and KRN 1 (pH_1 6.19).

In our study we focused also on an influence of slaughter weight of carcass pigs and lean meat percentage on measured values of pH_1.

According to table 4 it is possible to pronounce that with growing slaughter weights the values of pH_1 were decreasing. An average value of pH_1 on a level of 6.43 was found in slaughter pigs slaughtered in weight of 80 kg or less, pigs slaughtered in 130 kg and more reached value pH_1 on a level of 6.19. MOON et al. (2003) in their experiment studied an influence of slaughter weight on meat quality in 240 carcass hybrids of combination (Landrace x Yorkshire) x Duroc and from results they found out that meat quality can be better in accordance with growing slaughter weight from 95 kg to 125 kg. They found out the same results in their experiment that with growing slaughter weight the values of pH_1 are decreasing like we discovered in our study.

It is evident from table 5 that with growing lean meat percentage in carcass body the values of pH_1 are growing. The lowest average value 6.13 was determined in pigs with 49.9-45,0 lean meat percentage. On the contrary the highest value of pH_1 6.44 was determined in pigs with 60 and higher lean meat percentage. Statistical conclusive differences among values of pH_1 were found among different business classes according to lean meat percentage.

In our experiment the conclusions of SCHEPER et al., (1983) which mention that values of pH closely relate with meatness of pigs were not confirmed. With growing meatness of animal the value of pH is decreasing.

Table 3. Basic statistical characterizations for trait pH_1 according to boars (CLW x CL) x (D x BL)

Boar	n	average	S_x	X_{min}	X_{max}
H 13	41	**6.31**	0.37	5.53	7.02
H 14	45	**6.40** [b]	0.32	5.78	6.98
H 15	38	**6.27**	0.33	5.61	7.25
KRN 1	70	**6.19** [a,b]	0.30	5.70	7.06
KRN 2	21	**6.45** [a]	0.39	5.92	7.60
KRN 3	62	**6.33**	0.36	5.59	7.07

a,b: P≤0.05

Table 4. Characterization of studied traits according to slaughter weight in combination (CLW x CL) x (D x BL)

Weight interval (kg)	n	%	Slaughter weight (kg)	pH_1
under 80	8	2.9	76.44	6.43
80 – 89,9	21	7.6	84.95	6.40
90 – 99,9	38	13.7	96.03	6.32
100 – 109,9	75	27.1	105.05	6.38[a]
110 – 119,9	73	26.4	114.31	6.23 [a]
120 – 129,9	48	17.3	124.80	6.27
130 and more	14	5.0	137.24	6.19

a: P≤0.05

Table 5. Characterization of groups of carcass pigs classified to particular classes of SEUROP –system in combination (CLW x CL) x (D x BL)

Lean meat percentage in carcass body defined for quality class (%)	Business class	n	%	Lean meat portion (%)	pH_1
60 and more	S	44	15.9	60.74	$6.44^{b,c}$
55.0 – 59.9	E	172	62.1	57.65	$6.31^{a,b}$
50.0 – 54.9	U	58	20.9	53.08	$6.20^{a,c}$
45.0 – 49.9	R	3	1.1	47.77	6.13

a,b: P≤0.05 c: P≤0.01

Conclusion

On a base of measured values of pH_1 of pork meat in carcass pigs of tested hybrid combination (CLW x CL) x (D x BL) defect of pork meat PSE was found in 7.22 % of slaughter pigs only. According to reached results it is possible to pronounce that meat of slaughtered carcass pigs showed very good meat quality according to pH_1 values. From the study is clear that with growing slaughter weight of carcass pigs the values of pH_1 were decreasing and with growing lean meat percentage in carcass body values of pH_1 were growing.

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