RELATION BETWEEN IMPORTANT INDICATORS OF THE PIG MEAT QUALITY

A. Petričević, G. Kralik and G. Kušec

Department of Zootechnical Sciences, Faculty of Agriculture, University of J. J. Strossmayer, Osijek, Croatia

Background

It is a common practice, in countries with developed pig production, to appreciate more leaner swine carcasses in marketing of pork. Unfortunately, years of selection on leaner carcasses resulted in expression of some undesirable traits of pig meat. The most common of these traits are described by many authors as PSE and DFD meat (BRISKEY, 1990; BLENDL et al., 1991; HOFMANN, 1994 etc.). O'BRIEN (1995) reported that mutation for porcine stress syndrome as the major cause of PSE meat is present in more than 25% of swine breeding stock in North America and Europe. According to HONIKEL et al. (1985), KALLWEIT (1985), KRALIK et al. (1990), PETRIČEVIĆ et al. (1990, 1991), BLENDL et al. (1991) and KAUFMANN et al. (1996) this undesirable meat properties can be reliably determined by pH values and water holding capacity (w.h.c.).

The objective of this paper is to contribute in efforts of detection and to give a base for solving the problems connected to this undesirable occurrences.

Material and methods

Measurements of pH_1 and pH_2 values, water holding capacity, color, surface of *m. longissimus dorsi* cut with belonging fat layer were carried out on 310 primary processed carcasses from pigs of different genotypes. Values of pH_1 and pH_2 were measured within 45 min. and 24 hrs p.m. by portable digital pH-meter MA-5722 ("Iskra"-Kranj). Water holding capacity was determined by compression method according to GRAU and HAMM (1952) after 24 hrs of cooling. Meat color was determined on *m. longissimus dorsi* cut by Göfo device (Göttingen) after cooling.

The surfaces of *m. longissimus dorsi* and belonging fat layer (cm^2) were measured at loin cut between 2nd and 3rd rib counted from caudal side according to COMBERG (1978). Meat/fat ratio at loin cut was calculated as the ratio between surface of fat layer (cm^2) and surface of *m. longissimus dorsi* (cm^2).

After taking all the measures swine carcasses were classified in three groups on the basis of pH_1 and pH_2 values. In the 1st group were carcasses with pH_1 values > 5.80 (normal meat), in 2nd with $pH_1 \leq 5.80$ (PSE meat) and in 3rd with pH_2 values > 5.80 (DFD meat). Classification by these values were proposed by BLENDL et al. (1991).

Statistical analysis of the data were carried out by MS Excel 5.0 program.

Results and discussion

The results of the research are shown in tables 1-3. Average values of meat quality indicators of all 310 swine carcasses (table 1) was within boundaries for "normal" meat. It is important to declare that some authors (HONKAVAARA and TUOMINEN, 1984; DZIERZYNSKA-CYBULKA et al. 1982) used different values for establishing boundaries between normal and PSE and DFD meat. However, average values of the same quality indicators calculated for each group created by mentioned criterion show quite different situation. From the total number of 310 carcasses, 204 or 65.81% was classified in the 1st group with "normal" meat (pH_1>5.80), 77 or 24.84% in 2nd or PSE group ($pH_1 \leq 5.80$), and 29 or 9.35% in 3rd group (pH_2>5.80) or DFD meat. This results could be considered as unfavourable and they point out on the need of taking necessary measures for alleviation of this situation. One more reason for taking that in account seriously is the fact that all meat quality indicators ($pH1$, $pH2$, w.h.c. and color) showed congruent results in all three groups.

Results in table 2, which indirectly show the meat yield of the swine carcasses (meat/fat ratio at loin cuts) were as expected. As many authors reported earlier, carcasses from 1st group (PSE-meat) had greatest lean meat shares.

Correlations between meat quality indicators (table 1) were also calculated. Correlation between all meat quality indicators (table 3) were strong and statistically significant (p<0.01). However, correlation between quality indicators and surface of loin muscle/fat area and meat/fat ratio were weak and statistically insignificant.

This results are mainly in accordance with reports presented in table form by RAHELIĆ (1987) where differences between the same groups were statistically significant (p<0.01) for all examined traits ($pH1$, $pH2$ and color) with exception of w.h.c. As in present study, shown differences for lean meat proportion were not significant.

Conclusion

On the basis of presented results, following conclusions could be drawn:

1. According to determined meat quality indicators (especially pH values) large proportion of carcasses with PSE and DFD meat were found (24.84% and 9.35%, respectively) among 310 swine carcasses included in the research.

2. Despite such unfavourable results, means of quality indicators for all 310 carcasses showed satisfactory values because they were within boundaries generally accepted as normal. This points out the unreliability of conclusions based only on average values.

3. Coefficients of correlation between individual indicators of quality were high and tested differences were highly significant (p<0.01). However, correlations between quality indicators and meat yield indicators (*m. longissimus dorsi* and fat area as well as ratio between them) were very weak.

Literature

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Table 1. The main indicators of the pig meat quality

Group		pH$_1$	pH$_2$	w.h.c. (cm^2)	Color (Göfo)
1.	$\bar{x}$	6,281	5,568	8,245	65,475
	s	0.289	0.145	1.822	10.644
	s$\bar{x}$	0.020	0.010	0.127	0.745
2.	$\bar{x}$	5.672	5.499	10.852	50.052
	s	0.113	0.114	2.603	7.621
	s$\bar{x}$	0.0128	0.013	0.297	0.868
3.	$\bar{x}$	6.517	6.073	6.178	76.965
	s	0.275	0.164	1.832	10.105
	s$\bar{x}$	0.051	0.030	0.340	1.876
Total	$\bar{x}$	6.152	5.598	8.699	62.719
	s	0.382	0.209	2.457	12.729
	s$\bar{x}$	0.022	0.012	0.139	0.723

Table 2. MLD cut surface of the pig carcasses and fat/meat ratio

Group		MLD surface	Fat surface	Fat/meat ratio
1	$\bar{x}$	33.551	22.470	0.675
	s	4.412	4.231	0.124
	s$\bar{x}$	0.503	0.482	0.014
2.	$\bar{x}$	35.953	23.192	0.663
	s	6.233	4.234	0.158
	s$\bar{x}$	0.436	0.296	0.011
3.	$\bar{x}$	33.062	22.206	0.690
	s	5.935	3.574	0.164
	s$\bar{x}$	1.102	0.664	0.030
Total	$\bar{x}$	35.086	22.920	0.668
	s	5.914	4.181	0.150
	s$\bar{x}$	0.336	0.237	0.008

Table 3. Correlation of the important meat quality indicators and carcass parameters

	pH$_1$: pH$_2$	pH$_2$: W.H.C.	W.H.C. : Colour
r	0.419[**]	-0.349[**]	-0.390[**]
a	4.185	31.695	80.285
b	0.230	-4.108	-2.019

	pH$_1$: W.H.C.	pH$_2$: Colour	pH$_1$: Colour
r	-0.456[**]	0.351[**]	0.461[**]
a	26.783	-57.096	-31.769
b	-2.939	21.402	15.359

[**] significance level - $p<0.01$