INFLUENCE OF SEASON OF THE SLAUGHTER ON SELECTED MEAT QUALITY TRAITS OF FATTENERS WITH DIFFERENT HAL GENOTYPES

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Background

Improvement of different pigs' lines and breeds in direction to meatiness improvement caused increase of frequency of faulty meat. This problem refers especially meat with PSE syndrome (pale, soft, exudative) and its frequency in mass population. Nowadays is known that occurrence mentioned above defect is conditioned both by genetic factors (i.e. HAL^n gene) as by environmental factors conducted with slaughtering season, animals turnover and method of slaughtering.

The aim of this study was designating the influence of slaughtering season on selected meat quality traits of animals with different HAL genotypes.

Methods

Researches were conducted on 158 fatteners Polish Landrace White, held in identical conditions of fattening and management in farm 55 km far away from abattoir. Average meatiness of analysed population was 52,2±3,3%. Animals were slaughtered at weight 102±5,1 kg in two seasons: 83 animals in spring-summer season (30 - stress resistant animals-NN, 30 - carriers of HAL^n gene-Nn and 23 stress susceptibility-nn) and 75 in autumn-winter season (30 -NN, 30 -Nn and 15 -nn). The HAL genotypes were identified by PCR/RFLP method [Kurył & Korwin-Kossakowska 1993]. In the *longissimus dorsi* (LD) were evaluated: pH values with using Elmetron CP-311 pH-meter and muscle lightness using Momcolor D-3098 apparatus with white standard. In samples of LD muscle were also determined: Water Hold Capacity (WHC) according to Grau & Hamm [1952] method in Pohja & Ninivaara [1957] modification and R_1 value according to Honikel & Fisher [1977] method as ATP breakdown indicator. To classification PSE meat used terminal factors such as: $pH_{45} \leq 5.8$, $R_1 \geq 1.05$.

Data were calculated using two-way analysis of variance in non-orthogonal scheme. The differences between means for groups were calculated using Tukeys' test.

Results and discussion

Analysis of variance showed significant influence of HAL genotype on all investigated traits. Influence season of the year showed only on pH_{24} and Water Hold Capacity (WHC) parameters. For ultimate pH value interaction between both analysed factors i.e. season of slaughter and genotype was noted. [tab. 1, fig. 1]

Obtained results for influence of genotype on analysed meat quality traits confirmed an opinion about negative effect HAL^n genotype on values of meat quality traits. (Sellier 1998). But, the main topic of this work is expression of HAL ^{n} gene on meat quality discriminants in dependence of slaughters' season of fatteners. As was shown in table 1 significant influence of slaughters' season noted for WHC and ultimate pH of *longissimus dorsi* muscle, but for this trait obtained either between HAL genotype and season of slaughter significant interaction (at $P<0.05$)[fig. 1]. Fatteners slaughtered in spring-summer season characterised higher drip loss from LD muscle, regardless HAL genotype of animals. Differences between seasons for drip loss were statistically confirmed for homozygous groups of animals (NN and nn). It was reflected by higher frequency of PSE meat in both analysed homozygous groups of fatteners slaughtered in spring-summer season. [fig. 2] Attention turns acidifying muscle tissue in 24 hours *post mortem* of heterozygous animals slaughtered in spring-summer season, especially in comparison to analogous values of the same genetic group but slaughtered in autumn-winter season. It should the mention, that values of pH_{45} for heterozygous (Nn) fatteners slaughtered in analysed seasons were very close (6.02 in spring-summer season and 6.01 in autumn-winter season). Lower range of pH_{24} drop heterozygous animals slaughtered in spring-summer season is probably connected with greater consumption of glycogen both during preslaughter turnover as to 45 minutes after slaughter. It seems to be related with stronger reaction of fatteners on transportation circumstances in spring-summer season. This stronger reaction probably is result of higher activity of thyroid hormones for this group (Mitchell G. & Heffron J. J. A. 1982). Analogous trend noted for stress resistant fatteners, but mean values not differ statistically. Main decomposition of glycogen to lactate for stress resistant fatteners was to 45 minutes after slaughter. In further period, to 24 hours *post mortem*, glycogen changes showed as range of pH drop (pH_{45}-pH_{24}) not depended on season and ran slower: two times in relation to heterozygous (Nn) animals and two and half in relation to stress resistant (nn) fatteners. Low range of changes pH value from 45 minutes to 24 hours *post mortem*, typical for PSE faulty meat (pH_{45}-pH_{24} =0.23 in spring-summer season and 0.27 in autumn-winter season)(Przybylski et al. 1993), is result of rapid changes of glycogen which are occurs for this group of animals immediately after slaughter. The consequence of mentioned above reactions is very low pH_{45} and high frequency of PSE meat in both analysed seasons (73,9% in spring-summer season and 66,6% in autumn-winter season). As sown in fig.2 higher frequency of PSE meat for all population noted in spring-summer season (31,33% in relation to 26,67%). This confirms the researches of Denaburski & Wajda [1989], Bąk & Wajda [1995] and Kaczorek et al. [1989] who observed that most PSE meat occurred in summer.

Conclusions

Higher frequency of PSE meat noted in spring-summer season (31,33%) which was reflected in higher drip loss from LD muscle. Glycogen change dynamics grew up especially for stress resistant animals. The main effect of these changes was very low pH_{45} value and small range of acidifying muscle tissue from 45 minutes to 24 hours *post mortem* and in consequence high frequency of PSE meat in both analysed seasons.

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Fig.1 The influence of slaughters' season and HAL genotype on pH_{24} value.

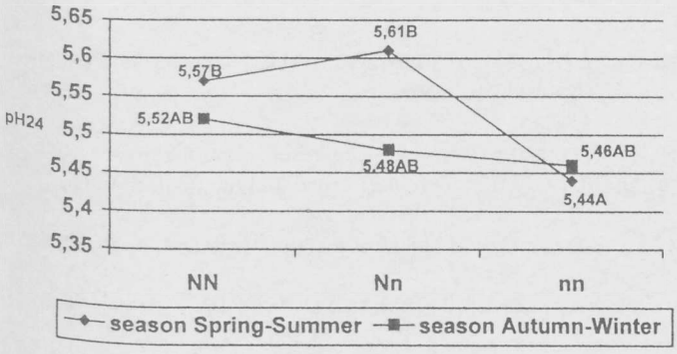

Fig.2 The frequency of PSE meat in dependency on slaughters' season and HAL genotype.

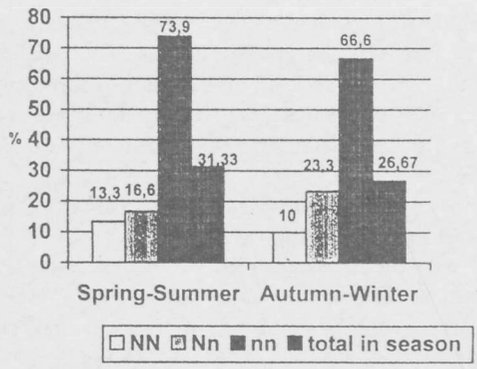

Table 1. The meat quality trait values in dependence of slaughters' season and HAL genotype.

Trait	Season	Genotype			Mean value	Influence			Differences		
		NN (n=60)	Nn (n=60)	nn (n=38)		Season	Genotype	Interaction (season x genotype)	NN-Nn	NN-nn	Nn-nn
pH_{45}	Spring - Summer	6,10 ±0,25	6,02 ±0,22	5,65 ±0,22	5,95 ±0,30	NS	**	NS	0,08	0,54**	0,46**
	Autumn - Winter	6,19 ±0,28	6,01 ±0,28	5,71 ±0,26	6,02 ±0,32				0,18	0,48**	0,30**
R_1	Spring - Summer	1,01 ±0,15	1,09 ±0,14	1,19 ±0,15	1,09 ±0,16	NS	**	NS	-0,08	-0,18**	-0,10**
	Autumn - Winter	0,96 ±0,12	1,05 ±0,15	1,15 ±0,14	1,03 ±0,15				-0,09**	-0,19**	-0,10
pH_{24}	Spring - Summer	5,57 ±0,15	5,61 a ±0,13	5,44 ±0,08	5,55 ±0,14	*	**	*	-0,04	0,13**	0,17**
	Autumn - Winter	5,52 ±0,13	5,48 b ±0,14	5,46 ±0,24	5,49 ±0,16				0,04	0,06	0,02
pH_{45}-pH_{24}	Spring - Summer	0,53 A ±0,24	0,42 ±0,21	0,23 ±0,22	0,41 ±0,25	*	**	NS	0,11	0,30**	0,19**
	Autumn - Winter	0,69 B ±0,31	0,53 ±0,26	0,27 ±0,16	0,54 ±0,30				0,16	0,42**	0,26**
Meat lightness	Spring - Summer	16,09 ±3,14	15,78 ±3,79	19,90 ±3,81	17,04 ±3,97	NS	**	NS	0,31	-3,81**	-4,12**
	Autumn - Winter	17,23 ±3,16	17,82 ±2,93	19,38 ±3,47	17,90 ±3,19				-0,59	-2,15	-1,56
WHC	Spring - Summer	5,54 B ±1,23	5,44 ±1,64	6,50 B ±1,22	5,98 ±1,43	**	**	NS	0,10	-0,96	-1,06**
	Autumn - Winter	4,49 A ±0,49	4,87 ±0,95	5,48 A ±0,82	5,00 ±0,88				-0,38	-0,99**	-0,61

Explanations: values in table are given as mean ± standard deviation for group; a,b - means signed (in columns) by different small letters differ statistically at P≤0.05; A, B - means signed (in columns) by different major letters differ statistically at P≤0.01;
* - difference between means of genotype (in line) is significant at P≤0.05; ** - difference between means of genotype (in line) is significant at P≤0.01;