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MEAT QUALITY OF DANISH YORKSHIRE PORKERS AND THEIR HYBRIDS WITH POLISH LARGE WHITE PIGS*

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Key words: pigs, crossbreeds, Danish Yorkshire, Polish Large White, meat quality

The examination included 48 fatteners originating from Polish Large White and Danish Yorkshire sows and Yorkshire boars. After carcass dissection into half-carcasses, meatiness measurements were made with a computer-coupled PQM-I/ZP apparatus. 45 min after slaughter, pH_1 was measured with the help of a CP-251 microcomputer pH-meter in the *longissimus* muscle between lumbal vertebrae 4 and 5 of the right-hand half-carcass. After 24 h of cooling, meat samples were collected from the lumbal vertebrae 1–4 section of the *longissimus* muscle of the right-hand half-carcass, 48 h after slaughter a complex meat quality evaluation was carried out with sensory, physiochemical and chemical methods and meat quality indices pH_S (integrated mean pH value), I_2 (quality index), Q_{11} (mean quality index calculated from 11 meat quality traits), were calculated.

In crossbreed fatteners, a lighter and less stable meat colour was found when compared with pure-bred Yorkshire pigs, which may point to their lowered quality level. The obtained results suggest that the meat of both fattener groups is of good quality. It may be stated in keeping with the goal and the hypothesis of the study that the use of the Danish Yorkshire breed may affect the raw material in the selected supply base, but the scale of that influence depends on the import volume.

INTRODUCTION

Pork production constantly aims at optimal solutions to increase meat quantity by improving the meatiness while maintaining meat quality [Grześkowiak *et al*., 1999; Kortz *et al.*, 1999]. In respect to pig breeding, the leading pork producer in the European Union is Denmark, where, according to Blicharski [2000], the mean carcass meat content is about 59.9%. In this context, it seems to be reasonable to use the Danish Yorkshire breed with good meat quality parameters [Koćwin-Podsiadła, 1998] for improving the meatiness of local pig population. Also bearing in mind the changes occurring in recent years in pig breeding and production in Poland in connection with the trend towards acquisition of animals that match the meatiness of the pigs from EU countries, this has resulted in an increased interest in importing white breeds [Różycki, 1966], since, according to Wojciechowski *et al*. [2002], local pig breeds do not show a genetic predisposition to high meatiness.

The aim of the study was to analyse the meat quality of Danish Yorkshire fatteners and their crossbreeds with Polish Large White in the raw material supply base of the Dobrosława Meat Plant at Sława with the assumption that the Yorkshire breed, together with Polish Large White pigs, will contribute to obtaining material with good meat quality parameters.

MATERIAL AND METHODS

The examination included 48 fatteners originating from Polish White Large and Danish Yorkshire sows and Yorkshire boars. The fatteners were from the raw material supply base of the Dobrosława Meat Plant at Sława. In both groups, 12 gilts and 12 hogs were examined.

When the fatteners gained 98±5 kg body weight, they were transported to the slaughterhouse of the Meat Plant at Sława (about 17 km) and slaughtered on the industrial line after stunning with tongs (620 V, 1 A, 2000 Hz, to 3 sec). Next, after carcass dissection into half-carcasses, a meatiness measurement was made with a computer-coupled PQM-I/ZP apparatus. 45 min after the slaughter, pH_1 was measured with the help of CP-251 microcomputer pH-meter and combined electrode of a ESAgP-302W type in the *longissimus* muscle between the lumbal vertebrae 4 and 5 of the right-hand half-carcass. After 24 h of cooling, meat samples were collected from the lumbal vertebrae 1–4 section of the *longissimus* muscle of the right-hand half-carcass, and 48 h from the slaughter, a complex meat quality evaluation adopted at the Department was carried out with sensory, physicochemical and chemical methods.

The following parameters were evaluated: (i) pH_{48} (after prior preparation of water meat extract (1:1), the extraction in water solution was measured after 1 h with a CP-251 micro-

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computer pH-meter and combined electrode of ESAgP-302W type); (ii) sensory traits: colour, wateriness, texture (elasticity) and marbleness (evaluation was made on a 1 cm meat slice cut from the anterior part of the sample according to Różyczka *et al*. [1975]. The evaluation was performed by a 5-person panel with verified sensory sensitiveness, using a five-point scale, in which three points mean optimal score); (iii) meat colour (with a Specol 11 spectrophotometer equipped with RO/45 reflection attachment – reflection was measured at a wavelength of 640 and 540 nm, and saturation, lightness and dominant wavelength were calculated successively according to Różyczka *et al*. [1968], Drewniak [2000], and colour stability (expressed as % of colour measure) according to Kortz [1970]; (iv) meat water-holding capacity (by Grau and Hamm method with modification of Pohja and Niinivaara [1957]); (v) thermal drip (according to Walczak [1959]); (vi) meat chemical composition, according to methods recommended by AOAC [1990]; (vii) dry matter content; (vii) fat content (Soxhlet); (ix) ash content; (x) total protein content (Kjeldahl); (xi) water-soluble protein content [Kotik, 1974].

On the basis of the obtained results, meat indices were calculated, *i.e*. pH_S (integrated mean pH value), I_2 (quality index) according to Kortz [1986] as well as Q_{11} (mean quality index calculated from 11 meat quality traits), according to Grajewska *et al*. [1984], was estimated for 11 traits.

The obtained results were analysed statistically using the Statistica PL computer software package. A non-orthogonal one-factor analysis of variance was used, while the means between experimental groups were compared with a Duncan's test [Ruszczyc, 1981].

RESULTS AND DISCUSSION

In order to compare the obtained results with data found in the literature, the values of colour traits expressed in the ICI system were converted to the Hunter Lab system [Drewniak, 2000].

In this experiment, no statistically significant differences were found in the meatiness and in the values of meat quality indices between the experimental groups (Table 1).

However, in the sensory evaluation, only one significant difference was found in meat marbleness (Table 2). Higher marbleness was characteristic for the meat of WY fatteners compared to the YY group. When evaluating sensory traits of meat, one should remember that the appearance of raw meat becomes more and more important from the point of view of the consumer [Skrabka-Błotnicka, 2000]. Among the remaining traits, no differences were found between the groups.

TABLE 1. Mean values ($\bar{x}$) and standard deviations (s) for meatiness and meat quality indices in porkers of both experimental groups.

Trait	Experimental groups			
	YY		WY	
	$\bar{x}$	s	$\bar{x}$	s
Meatiness (% meat in carcass)	55.51	10.13	51.11	11.14
pH_1	6.53	0.22	6.63	0.17
pH_u	5.51	0.05	5.50	0.04
pH_s	5.97	0.17	6.03	0.15
I_2	3.90	0.57	4.90	0.48
Q_{11}	3.00	0.31	2.97	0.25

TABLE 2. Mean values ($\bar{x}$) and standard deviation (s) for meat sensory traits in porkers of both experimental groups.

Trait	Experimental groups			
	YY		WY	
	$\bar{x}$	s	$\bar{x}$	s
Colour, score	2.60	0.64	2.62	0.61
Wateriness, score	2.64	0.48	2.81	0.28
Texture, score	2.64	0.71	2.67	0.41
Marbling, score	1.27^{A}	0.36	1.67^{B}	0.56

a, b – significant at $p \leq 0.05$; A, B – significant at $p \leq 0.01$

Among colour traits (Table 3), significant differences were found in the saturation, dominant wavelength and colour stability, *i.e.* worse parameters were characteristic for WY group, which may indicate lighter meat with a tendency towards lower quality and to a lower contribution of red colour and a higher yellow colour. This group (WY) was also distinguished by slightly lower thermal drip, which is very important from a technological point of view (Table 3). In the mean values of colour lightness and WHC, no statistically significant differences were found.

TABLE 3. Mean values ($\bar{x}$) and standard deviation (s) for meat colour and water-binding capacity traits in porkers of both experimental groups.

Trait	Experimental groups			
	YY		WY	
	$\bar{x}$	s	$\bar{x}$	s
System ICI				
Colour lightness (%)	24.84	4.42	27.84	4.51
Colour saturation (%)	19.45^{A}	2.27	27.42^{B}	6.84
Dominant wavelength (nm)	583.5^{A}	2.10	585.7^{B}	2.31
System Hunter Lab				
L*	57.64	4.79	55.17	4.71
a*	13.33	3.92	8.68	1.45
b*	11.30	3.93	7.36	1.19
Colour stability (% colour change)	7.92^{a}	8.17	13.87^{b}	9.72
WHC (% bound water)	64.92	6.86	68.60	7.10
Thermal drip (%)	30.8^{a}	2.78	29.34^{b}	2.02

a, b – significant at $p \leq 0.05$; A, B – significant at $p \leq 0.01$

As regards the basic chemical composition (Table 4), differences were found in the mean values for fat, total protein and ash content, but at the same time YY group was distinguished by a higher fat content compared to WY group (Table 4). In the opinion of Wiesemüller [1996], the intramuscular fat content should amount to 2–2.5%, and even to 3% according to Denaburski and Bąk [1999]. It is a striking fact that no improvement in marbleness was observed despite the high fat content in that group [Denaburski & Bąk, 1999]. On the other hand, the WY group was distinguished by higher total protein and ash contents compared to the YY group, whereas no differences were found in dry matter and water-soluble protein contents.

On the basis of the results obtained, one may expect that the use of the Yorkshire breed together with Polish Large White should produce material with good meatiness while maintaining good meat quality parameters. It should be

TABLE 4. Mean values ($\bar{x}$) and standard deviation (s) for meat chemical composition in porkers of both experimental groups.

Trait	Experimental groups			
	YY		WY	
	$\bar{x}$	s	$\bar{x}$	s
Dry matter (%)	25.71	0.77	25.64	0.71
Fat (%)	3.20^{a}	1.34	2.37^{b}	1.06
Total protein (%)	21.32^{A}	0.79	22.03^{B}	0.72
Water-soluble protein (% in meat)	8.58	0.5	8.99	0.60
Ash (%)	1.12^{a}	0.05	1.20^{b}	0.06

a,b – significant at $p \leq 0.05$; A, B – significant at $p \leq 0.01$

remembered, however, that the degree of this influence depends on the import volume, which may require further improvement in the pig population in the discussed raw material supply base.

CONCLUSIONS

1. In crossbreed fatteners, a lighter and less stable meat colour was found compared to pure-bred Yorkshire pigs, which may suggest a tendency towards lower quality.

2. The obtained results suggest that the meat of both fattener groups is of good quality.

3. It may be stated, in keeping with the assumptions of the study, that the use of the Danish Yorkshire breed may have a positive effect on the raw material in the selected supply base, but its scale depends on the import volume.

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JAKOŚĆ MIĘSA TUCZNIKÓW DUŃSKIEJ RASY YORKSHIRE ORAZ ICH MIESZAŃCÓW Z RASĄ WIELKĄ BIAŁĄ POLSKĄ

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Badaniami objęto 48 tuczników pochodzących po lochach rasy wbp i danish yorkshire i knurach rasy yorkshire. Po podziale tusz na półtusze przeprowadzono pomiar mięsności aparatem PQM-I/ZP sprzężonym z komputerem. Po upływie 45 minut od uboju mierzono pH_1 przy pomocy pH-metru mikrokomputerowego CP-251 w mięśniu najdłuższym (*longissimus*) w odcinku między 4 a 5 kręgiem lędźwiowym prawej półtuszy. Po 24 godzinnym schładzaniu pobrano próby mięsa z odcinka między 1 a 4 kręgiem lędźwiowym mięśnia *longissimus* z prawej półtuszy, a 48 godzin od momentu uboju przeprowadzono kompleksową ocenę jakości mięsa przy zastosowaniu metod sensorycznych, fizykochemicznych i chemicznych oraz wyliczono wskaźniki jakości mięsa: pH_s, I_2, $Q_{11.}$

U tuczników mieszańcowych w porównaniu z czystorasowymi yorkshire stwierdzono jaśniejszą i mniej trwałą barwę mięsa (tab. 3), co wskazywać może na ich większą skłonność do wadliwości. Uzyskane wyniki sugerują, że mięso tuczników obu grup cechuje dobra jakość. Zgodnie z celem i hipotezą pracy można stwierdzić, że wykorzystanie duńskiej rasy yorkshire może wywierać wpływ na surowiec w wybranym zapleczu, ale skala tego wpływu uzależniona jest od wielkości importu.