Meat Quality of Pigs of Different Origin of the Old and New States of the Federal Republic of Germany

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SUMMARY:The meat quality of pigs of different origin was investigated by objective methods. The aim of this study was to assess the occurrence of meat quality alterations (PSE- and DFD-meat) as they are influenced by the genetic line and origin of the pigs. The meat quality was determined by the pH- and pulse-impedance method in the M. longissimus. In some animals the drip loss and the colour brightness were measured in addition. The lean meat percentage was classified according to the EUROP-system.
The percentage of pigs with poor meat quality was strongly influenced by the genetic origin as well as by the breeding system, and the lean meat percentage.
The results indicate that the selection for a high lean meat percentage must be accompanied by parameters of stress susceptibility and meat quality. By these means it should be possible to achieve a combination of high carcass quality and high meat quality.

INTRODUCTION

The changed marketing conditions for pork require a thorough analysis of the state of pig production in Eastern Germany. Among many factors the carcass and meat quality influence on the effectivenes is particularly important. This study gives some information about the meat quality in pigs of varions origins of the new states of the FRG. Moreover the carcass and meat quality of pigs originating from old and new federal states was compared directly. The aim of this study was to give a basis for dicussing possibilities of the production of pigs characterised by high carcass quality as well as by desired meat quality.

MATERIALS and METHODS

The M. longissimus of 10135 carcasses of pigs fattened in 7 different enterprises was investigated for meat quality. All pigs were slaughtered in the same slaughter-house between Sept. 1987 and May 1989. The pigs are hybrids from three-race-crossing and rotary crossing, respectively (tab. 1). This is also true for the pigs of origin "B" (tab. 3) whereas the pigs of origin "A" are from Western Germany. They are characterised by a certain percentage of Piétrain genes. The material described in table 2 originates from a three-race-crossing (Landrasse, Large White, Leicoma). All pigs except the material "A" were reared in large production units and fattened in specialised fattening.
The determination of watery pork with structural alteration was performed by the pulse-impedance method (instrument UP 1.1; PLIQUETT et al., 1987; SCHÖBERLEIN et al., 1988). The basic principle of this method is the deformation of an electrical pulse due to the electrical resistance of the material. The UP 1.1 indicates a combination of parameters (h_β) characterising the intracellular and extracellular resistance of the meat specimen. The parameter h_β correlates with the water binding capacity of meat. Low values indicate meat quality alterations (PSE-meat). The best differentiation between meat of normal quality and PSE-meat was obtained 24 ± 4 hours post mortem. Meat was classified as being watery if the h_β -value was below the limit of 40.
The pH-value was measured with the pH-meter TM 4 / EGA 80 N or EGA 81 N in the M. longissimus (13th/14th rib) 45 minutes p.m. as well as 24 hours p.m. The determination of dark, firm and dry meat (DFD-meat) was done on the basis of the pH-value 24 hours p.m. (pH_{24}) The following limits were used:

pH_{24}	meat quality
< 5.90	normal
5.90 - 6.19	slightly altered
≥ 6.20	dark, firm, dry meat.

The electrical conductivity of the meat was determined with the instrument LF 191, WTW, Weilheim.
The colour brightness was measured as remission value with the photometer Specol at 520 nm 24 hours p.m.
Furthermore the drip loss of a meat specimen was determined under standardised conditions. The limit values of pH 45 minutes p.m. < 5.8, colour brightness > 28 p.c. and drip loss > 5.0 p.c. formed the basis for differentiating PSE-meat from normal meat (tab. 2). In tables 1 and 3 the h_{β}-value was used as additional criterion. The carcass classification was done according to the EUROP-system.

RESULTS and DISCUSSION

The results of the meat quality of pigs fattened in the area covered by the slaughter-house of Leipzig are listed in table 1. The average percentage of structural changed, exudative meat (PSE-meat) in the M. longissimus was 13.6 p.c. The share ranged from 7.4 to 19.4 p.c. depending on the fattening enterprise. The DFD-meat share was about 2 p.c. (tab. 1). Pigs from the enterprise Bo had a considerably higher occurence of DFD-meat (5.1 p.c.). Moreover 21 p.c. of these pigs had pH_{24}-values of 5.90 - 6.19 indicating a tendency to DFD-meat quality alterations. In contrast to this the PSE-meat share was in the medium range of the pigs investigated. This leads to the conclusion that the glycogen pool of these pigs was very low.
The lean meat percentage and other quality criteria of pigs slaughtered in different slaughter-houses in Thuringia are described in table 2. The pigs were characterised by a low lean meat percentage. The percentage of grades E and U is about 40 p.c. lower than desired. On the other hand good values concerning the meat quality were obtained. This led to a low number of pigs with PSE-meat quality.
A direct comparison of carcass and meat quality properties of pigs produced in old (A) and new (B) federal states of Germany is given in table 3.
It becomes obvious that the material "A" had a considerably higher percentage of meat quality alterations than pigs from "B" (64 p.c. PSE-meat versus 15 p.c.). The occurence of DFD-meat is negligible in both origins. The results of the carcass graduation are distinctly better in origin A (83.3 p.c. in E/U vs 36.7 p.c.). Especially pigs from origin "A" tend towards a higher share of PSE-meat in the grades E and U compared to the grades R/O/P. On the other hand, there were pigs combining a high lean meat percentage with a favourable meat quality.
The differences in meat quality showed in tables 1 and 3 can be traced back to differences in genetic origin (origin "A" and "B") and effects of transportation because the conditions at slaughter were nearly identical.These results point out the importance of adequate treatment of the pigs prior to slaughter. Especially in pigs of the enterprise Bo the aboveaverage DFD-share indicates a high level of stress before ande during transportation. Pigs fattened in the new federal states have on average a better meat quality but they are characterised by a considerably lower lean meat percentage. A combination of high lean meat yield and desired meat quality must be aimed at.

CONCLUSIONS

The following conclusions can be drawn from these results:

1. The lean meat yield of the pigs in the new federal states has
   to be increased by mating sows and boars with a high lean meat percentage (up to 60 p.c.; Piétrain; Pi x Ha and
2. others).
   To avoid a dramatic deterioration in meat quality properties, boars combining a high lean meat yield with low stress
3. susceptibility should be used.
4. The attention must be drawn to the selection of larger sows in the new federal states.
5. The environmental conditions in rearing, fattening and transportation must be improved.
   The selection strategy must be directed towards an improvement of production traits accompanied by parameters of meat quality and stress susceptibility.

Tab. 1: Meat quality of pigs of different enterprises slaughtered in the slaughter-house Leipzig

fattening enterprise	n	structural changed, exudative meat h_β %	dark, firm, dry meat pH_{24} 5.90 - 6.19 %	dark, firm, dry meat pH_{24} ≥6.20 %
Li	3043	19.4	6.2	1.1
Bo	1812	11.9	21.1	5.1
Br	1288	7.4	7.8	1.3
Tr	1242	12.6	8.4	1.7
Mö	1099	10.4	7.0	0.6
Oe	881	9.3	10.1	1.6
Sa	770	15.7	6.9	1.0
	10135	13.6	9.8	1.9

Tab. 2: Lean meat percentage and meat quality of pigs slaughtered in different slaughter-houses in Thuringia (B)

Slaughter day		I	II	III	IV
n		120	120	119	121
Grades E/U %		51.4	27.6	36.8	35.0
Lean meat percentage %		48.5	46.5	46.3	49.6
	SD	3.44	4.47	3.57	3.89
pH_{45}		6.41	6.35	6.52	6.40
	SD	0.35	0.35	0.44	0.32
pH_{24}		5.35	5.62	5.45	5.60
	SD	0.16	0.19	0.17	0.34
Conductivity (mS/cm)		6.60	6.80	6.40	7.20
	SD	2.20	2.16	2.67	1.80
Drip loss %		3.30	2.85	3.75	3.30
	SD	2.30	1.82	2.18	1.82
Colour brightness Rem.%		21.5	21.9	22.3	21.9
	SD	2.48	3.62	2.54	2.54
PSE-meat %		5.8	5.0	7.6	5.6

Tab. 3: Comparison of carcass and meat quality of pigs fattened in old (A) and new (B) federal states of Germany

Origin	n	Structural changed, exudative meat	Dark, firm, dry meat pH_{24}		Grades		Percentage of structural changed, exsud. meat in	
			5.9-6.19	≥ 6.20	E/U	R/O/P	E/U	R/O/P
		%	%	%	%	%	%	%
A 1								
A 2	238	52.9	4.2	3.4	94.1	5.9	54.9	21.4
A 3	187	66.3	1.6	0.5	77.5	21.4	72.4	42.5
A 4	179	64.2	2.2	0.6	76.5	23.5	64.2	64.3
A 5	93	85.0	0	0	78.5	20.4	86.3	84.2
A Σ	68	67.6	4.4	0	85.3	14.7	65.5	80.0
A x̄	765							
		64.0	2.6	1.3	83.3	16.3	65.5	56.8
B 1								
B 2	1346	12.1	5.0	1.7	51.9	38.2	14.0	8.9
B 3	753	17.9	1.2	0.4	15.3	84.7	20.0	17.5
B 4	248	22.2	2.0	0	14.5	83.0	25.0	22.3
B Σ	56	14.3	0	0	57.1	41.1	6.3	26.1
B x̄	2403							
		15.0	3.4	1.1	36.7	57.5	15.0	15.2

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