

## CHEMICAL COMPOSITION AND TEXTURE PARAMETERS OF LOIN FROM POLISH LANDRACE FATTENERS SLAUGHTERED IN DIFFERENT AGE\*\*

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**Abstract:** Gilts were slaughtered at 60<sup>th</sup>, 90<sup>th</sup>, 120<sup>th</sup>, 150<sup>th</sup>, 180<sup>th</sup> and 210<sup>th</sup> day of breeding (6 sows in each age). After evisceration in 4°C during 24 hours the samples were taken from right half of carcasses of *longissimus dorsi* (behind the last rib between the thoracic and lumbar vertebrae) muscle. In the meat to carry out instrumental measurement of shear force and texture parameters. The meat of loin was subjected to chemical analysis to determine its dry matter, water, protein, fat and ash content. The age of fatteners slaughtering beside the genotype and sex is the basic factor influencing on quality, nutritional value and attractiveness for consumer of pig meat.

**Key words:** gilts, slaughter age, loin, chemical composition, texture parameters

### Introduction and literature review

The chemical composition and quality of pork depends on genetic (breed, crossbreeding scheme and sex) and environmental factors (nutrition, management conditions, and slaughter age). Studies by *Hviid* (2002) and *Lachowicz et al.* (1998, 2003) have shown that chemical composition and

texture parameters depend not only on breed but also on stress sensitivity genotype. When meat is preserved and prepared for consumption using the most common method of heating, thermal denaturation of proteins occurs, which leads to certain changes in the microstructure of muscle fibres, connective tissue, and water holding capacity of meat. Differences in chemical composition and changes during pork preservation shape meat texture and tenderness (Trombetta *et al.* 1997; Lachowicz *et al.* 1998). It is already known that chemical composition and changes during pork processing influence the texture and meat tenderness.

The aim of the present study was to determine the effect of slaughter age on the chemical composition, texture parameters and shear force of the *m. longissimus* of Polish Landrace fatteners pigs.

## Material and methods

A total of 36 fattening gilts were investigated. Gilts were kept from 60 to 210 day of breeding at Pig Testing Stations and fed complete diet. Pigs were slaughtered at 60<sup>th</sup>, 90<sup>th</sup>, 120<sup>th</sup>, 150<sup>th</sup>, 180<sup>th</sup> and 210<sup>th</sup> day of breeding (6 sows in each age). After afeing in 4°C during 24 hours the samples were taken from right half of carcasses of *longissimus dorsi* (behind the last rib between the thoracic and lumbar vertebrae) muscle.

Instrumental measurement of shear force and texture parameters in accordance with standard PN-ISO 11036 were carried out on meat.

### Instrumental measurement of shear force

Cylinder-shaped samples (14 mm in diameter and 15 mm in height) were cut from the meat roasted at 180°C to an internal temperature of 78°C. Shear force was measured using a TA-XT2 Texture Analyzer (Stable Micro Systems) with a Warner-Bratzler attachment and a triangular notch in the blade. The blade speed during the test was 1.5 mm/s. The result was presented as force per area (kG/cm<sup>2</sup>).

### Instrumental measurement of texture parameters

Cylinder-shaped samples (14 mm in diameter and 15 mm in height) were cut from the meat roasted as above. The texture was analyzed using a TA-XT2 Texture Analyzer (Stable Micro Systems) with an attachment in the form of a cylinder 50 mm in diameter. The samples were subjected to a double pressing test using a force of 10 g to 70% of their height. The cylinder speed was 2 mm/s, and the interval between pressures was 3 s.

The meat of loin and ham was subjected to chemical analysis to determine its dry matter, water, protein, fat and ash content. The meat sample was minced twice in a meat mincer and a thoroughly mixed sample was placed in a tight vessel completely filled with the sample, from which weighed portions were taken for each determination. The tests were started immediately after sample preparation. The water content was determined using the drying method in accordance with standard PN-ISO-1442, protein content (%) using the method of Kjeldahl in accordance with standard PN-A-04018:1975, fat content (%) using the method of Soxhlet in accordance with standard PN-ISO-1444, and total ash content in accordance with standard PN-ISO-936.

The results were analyzed statistically using SAS software. The significance of differences between the means was analyzed using the Student's t-test and shown as means  $\pm$  SD (standard deviation).

## Results of investigations and discussion

When Polish landrace fatteners were growing older the total solids, protein content, fat content and ash content were also growing in loin – table 1. The most advantageous results for chemical composition from the point of consumer (protein content) were observed in fatteners aged 210 days.

**Table 1. Chemical composition of Polish Landrace fatteners' loin**

Slaughter age	Traits %				
	Dry matter	Water	Crude protein	crude fat	ash
60 <sup>th</sup> day	23.84 <sup>a</sup>	76.16 <sup>a</sup>	21.02 <sup>a</sup>	1.19 <sup>a</sup>	1.22
90 <sup>th</sup> day	26.56 <sup>bc</sup>	73.44 <sup>a</sup>	23.73 <sup>b</sup>	1.40	1.08
120 <sup>th</sup> day	25.88 <sup>b</sup>	74.12 <sup>a</sup>	22.71 <sup>b</sup>	1.43	1.17
150 <sup>th</sup> day	26.36 <sup>bc</sup>	73.64 <sup>a</sup>	23.36 <sup>b</sup>	1.40	1.11
180 <sup>th</sup> day	27.45 <sup>bc</sup>	72.55 <sup>b</sup>	24.39 <sup>b</sup>	1.52 <sup>b</sup>	1.05
210 <sup>th</sup> day	28.02 <sup>c</sup>	71.98 <sup>b</sup>	24.88 <sup>bc</sup>	1.47	1.16
SEM	1.84	1.84	1.66	0.21	0.12

Values in the same columns with different letters differ significantly  
a, b -  $P \leq 0.05$

Obtained results show worsening of texture parameters and Warner-Bratzler cutting force and at the same time lower attractiveness of meat from

older fatteners – table 2. *Ellis & Avery* (1990) examined synthetic and hybrids lines of fatteners and showed that high quality of carcass was possible when the pigs had been slaughtered with higher body mass and elder age. The similar tendency was observed in fatteners JRS (*Paściak*, 2002).

The study was carried out using pigs of one sex, i.e. gilts. *Barton-Gade* (1987), and *Wood et al.* (1989) showed an effect of sex on meat quality traits. *Cameron et al.* (1990), *Trombetta et al.* (1997) and *Warriss et al.* (1990) reported a marked effect of breed (genotype) on the chemical composition and quality traits of pork meat. According *Migdał et al.* (2006) the loin of Pietrain fatteners was characterized by higher shear force and greater hardness compared to the loin of Polish Landrace and Polish Large White fatteners. Fatteners with high speed of growth were characterized by lower Warner-Bratzler cutting force and by soft loin after roasting. Also that group fatteners had lower amounts of fat tissue.

**Table 2. Texture parameters and shear force value of Polish Landrace fatteners' loin**

Slaughter age	Texture parameters					Shear force KG/cm <sup>2</sup>
	hardness (N)	springiness	cohesiveness	chewiness (N)	resilience	
60 <sup>th</sup> day	54.17 <sup>a</sup>	0.482	0.528	14.73 <sup>a</sup>	0.258	3.03 <sup>a</sup>
90 <sup>th</sup> day	45.47 <sup>a</sup>	0.600	0.504	12.76 <sup>a</sup>	0.220	3.86 <sup>a</sup>
120 <sup>th</sup> day	87.42 <sup>b</sup>	0.524	0.493	22.35 <sup>b</sup>	0.211	5.10 <sup>b</sup>
150 <sup>th</sup> day	93.79 <sup>b</sup>	0.564	0.475	25.28 <sup>b</sup>	0.205	5.37 <sup>b</sup>
180 <sup>th</sup> day	114.60 <sup>c</sup>	0.606	0.521	36.41 <sup>c</sup>	0.208	5.23 <sup>b</sup>
210 <sup>th</sup> day	129.64 <sup>c</sup>	0.594	0.542	45.10 <sup>d</sup>	0.237	5.99 <sup>b</sup>
SEM	18.78	0.03	0.011	6.21	0.009	0.35

Values in the same columns with different letters differ significantly

a, b -  $P \leq 0.05$

As the fatness of pigs decreased, the losses during the preservation and preparation of the meat for consumption increased (*Trombetta et al.*, 1997). *Hviid* (2002) and *Lachowicz et al.* (1998, 2003) showed that chemical composition and texture parameters depend not only on breed but also on stress sensitivity of genotype and muscle fibre structure. *Green* (1997) reported that the meat of HAL-free fatteners with the NN genotype was characterized by a higher shear force compared to the meat of fatteners with the Nn genotype. Because the structure and physiological properties of muscles have a considerable effect on meat tenderness (*Bailey and Light*,

1989; *Lachowicz et al.*, 1998, 2003), to give a complete and correct discussion of the results obtained, it is necessary to determine the genotype, age of pigs and the structure of muscle fibres.

## Conclusion

The age of fatteners at slaughtering beside the genotype and sex is the basic factor influencing on quality, nutritional value and attractiveness for consumer of pig meat.

## HEMIJSKI SASTAV I PARAMETRI STRUKTURE MESA SLABINE TOVLJENIKA RASE POLJSKI LANDRAS ZAKLANIH U RAZLIČITOM UZRASTU

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## Rezime

Nazimice su zaklane 60., 90., 120., 150., 180. i 210. dana odgoja (šest krmača za svaki uzrast). Nakon 24 sata na 4°C uzorci mišića *longissimus dorsi* (iza poslednjeg rebra između grudnih i krsnih pršljenova) su uzeti sa desne polutke. Na mesu su rađena instrumentalna merenja sile sečenja i parametri strukture. Meso slabine je podvrgnuto hemijskoj analizi radi utvrđivanja sadržaja suve materije, vode, proteina, masti i pepela. Uzrast tovljenika pre klanja, pored genotipa i pola, je osnovni factor koji utiče na kvalitet, nutritivnu vrednost i privlačnost svinjskog mesa za potrošače.

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