MEAT QUALITY OF LITHUANIAN WHITE PIGS IN COMPARISON TO IMPORTED PIG BREEDS

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Summary. As demand of qualitative pork is growing in the market, there is need to select pigs not only according the growth speed, feed input and muscularity, but also according the meat quality. In our study the meat quality of Lithuanian White, Large White, Landrace and Yorkshire breed pigs was compared. The results from this study showed that meat quality indexes of these breeds were different. Breed had the highest significant influence on the meat lightness L* (P<0.05), drip loss (P<0.001) and water-binding capacity (P<0.05-0.01). In addition, the significant differences between intramuscular fat were registered. The results also show that Lithuanian White pig meat had the highest and Large White pig meat had the lowest amount of intramuscular fat. The results from this study demonstrated that various meat quality indexes varied more inside the breed than among the breeds.

Keywords: pigs, breed, meat quality, selection.

LIETUVOS BALTŲJŲ IR IMPORTUOTŲ KIAULIŲ VEISLIŲ MĖSOS KOKYBĖS PALYGINIMAS

Santrauka. Rinkoje didėjant kokybiškos kiaulienos paklausai, būtina vykdyti kiaulių selekciją ne tik pagal augimo spartą, pašarų sąnaudas, raumeningumą, bet ir pagal mėsos kokybę. Atlikti tyrimai su Lietuvos baltųjų, Didžiųjų baltųjų, Landrasų ir Jorkšyrų veislių kiaulių mėsa parodė, kad ji skiriasi savo kokybiniais rodikliais. Labiausiai veislė darė įtaką mėsos spalvos intensyvumui L* (p<0,05), vandeningumui (p<0,001) ir mėsos vandens rišlumui (p<0,05-0,01). Taip pat ženklūs tarpveisliniai skirtumai buvo ir tarpraumeninių riebalų, kurių daugiausia buvo Lietuvos baltųjų kiaulių, o mažiausiai – Didžiųjų baltųjų kiaulių mėsoje. Tyrimai parodė, kad atskiri mėsos kokybės rodikliai žymiai daugiau įvairuoja veislės viduje negu tarp veislių.

Raktažodžiai: kiaulės, veislė, mėsos kokybė, selekcija.

Introduction. Consumers and producers demand higher requirements for pork quality and safety. Genetic and non-genetic factors have an influence on meat quality and are deciding factors about its value in the market, also (Bryhni et al, 2003). Pig selection was carried out in the direction of growth speed, muscularity increase and feed input decrease without meat quality considering for a long time (Lundström et al, 1989). Meat quality declines or improves very slowly and long-lasting unkept selection according to the meat quality leaded to siginificant meat quality decline (Jonsall et al, 2002). It is possible to influence the quality of offspring carcasses already by choosing animals for the mate (Pierszchala et al, 2003). Meat quality is defined by culinary, chemical-physical, technological and biological characteristics. Lean content and meat quality are the most important indexes of pork quality in regard to market and consumer requirements (Andersen, 2000). But lean content not always correlates with meat quality. Pig breed and individual characteristics have an influence on meat quality. Meat from some pig breeds with higher lean content has more acid, paler color, less water holding capacity and higher cooking loss. It has more protein and less intramuscular fat which influences meat juiciness (Kaselo, 1995; Nürnberg and Ensen, 1993; Aaslyng, 2003). Such meat is less attractive for the consumers and producers and also is not suitable for manufacturing of some products (Warris, 2004). Meat with pale color and high drip loss is referred to PSE (pale, soft and exudative) meat.

Lithuanian White is the main pig breed in the country. Large White, Landrace and Yorkshire pigs are bred widely, also (Klimas, 2002). Big variety of pig breeds allows choosing the most optimal breeding combinations by selection not only according to the growth speed, muscularity and feed input, but according to the meat quality, as well (Moelich et al, 2003). However, it is important to evaluate meat quality of pigs bred in Lithuania on purpose to carry out an effective selection of pigs according to the meat quality.

The aim of the research was to compare meat quality of Lithuanian White and imported pig breeds.

Materials and methods. The samples for analysis were taken from 80 Lithuanian White (LW), Large White (LLW), Landrace (L) and Yorkshire (Y) pig carcasses. Twenty animals (10 swine and 10 castrates) were chosen from each breed for to characterize the breed. Pigs were held at the Control Feeding Station of Pigs under standard feeding and keeping conditions. Pigs were slaughtered at the weight of 95 kg at the same station. After carcass chilling (after 24 h) meat samples were taken from *musculus longissimus dorsi* for meat quality evaluating. At 48 h post-mortem, dry matter (with automatic scales for dry matter Scaltec SM-1), pH (with pH-meter Inolab-3), color (with Minolta Chroma Meter 410) by measuring the lightness L*, redness a* and yellowness b*, drip loss (weight loss during 24 h), water-holding capacity (Grau and Hamm), cooking loss (vacuumed and boiled at 70ºC for 30 min.), shear force (Warner-Bratzler test), intramuscular fat (Soxterm), protein (Kjeldahl), ash (burning organic matter at 700ºC) were determined at the Laboratory of Meat Characteristics and Quality Assessment in Lithuanian Veterinary Academy. Data were analyzed by using statistical R pack version 2.0.1.

Results. Data of the study are given in the table and represent the difference of meat quality among different pig breeds (Table 1).

Table 1. **Data of pig meat quality**

Index	Breed			
	Lithuanian White	**Large White**	**Landrace**	**Yorkshire**
Dry matter, %	25.27±0.25	24.69±0.08	25.25±0.21	24.76±0.14
pH	5.45±0.02	5.40±0.01	5.41±0.01	5.43±0.03
Color				
L*	54.52±0.41	53.55±0.40	54.73±0.37	54.67±0.61
a*	13.36±0.25	14.11±0.16	13.77±0.20	13.86±0.20
b*	5.11±0.13	5.38±0.15	5.89±0.22	5.86±0.18
Drip loss, %	4.62±0.30	7.47±0.32	6.39±0.42	5.95±0.28
Water holding capacity, %	54.59±1.15	49.22±0.94	51.38±0.77	52.13±0.73
Cooking loss, %	29.74±0.56	30.87±0.31	30.56±0.48	29.65±0.66
Shear force, kg/cm^2	2.05±0.09	1.80±0.10	2.00±0.13	1.98±0.09
Intramuscular fat, %	2.04±0.03	1.40±0.09	1.70±0.11	1.72±0.14
Protein, %	22.31±0.24	22.18±0.13	22.48±0.15	22.00±0.12
Ash, %	1.05±0.02	1.11±0.02	1.07±0.02	1.06±0.14

The amount of dry matter from the meat of investigated pigs was small and made 0.58 percent. This difference was statistically significant ($P<0.05$) between LW and LLW pigs. The differences of meat pH among breeds were insignificant. The breed had an influence on meat colour. L* value was the highest in LLW meat and the lowest L* value was in L pig meat ($P<0.05$). The other differences of this index among breeds were not significant. Breed had an influence on a* value. The differences of this index among LW, L and Y were insignificant and the difference among LW and LLW was statistically significant. The difference of b* value among breeds was low. The highest b* value was in LW meat and the lowest b* value was in LLW pig meat ($P<0.05$). Drip loss is an important index of meat quality. Its differences among breeds were significant. LLW pig meat had the lowest drip loss and LW pig meat had the highest drip loss ($P<0.001$). The differences of drip loss were high between LW and L pig breeds and also between LW and Y pig breeds ($P<0.01<0.001$). Water-holding capacity is an important index what characterizes meat technological value and suitability for meat products' manufacturing. LW pig meat had the highest water-holding capacity. The differences of water-holding capacity between LW and other breeds' meat were statistically significant ($P<0.05$-<0.01). LLW pigs had the lowest water-holding capacity. The difference of cooking loss among breeds was low ($P<0.05$). Also the differences between shear force and breeds were insignificant ($P<0.05$).

Pig genotype with lower intramuscular fat amount was formed during pigs' selection according to muscularity. Their meat became less juicy, more tough and dry. LW pigs had the higher amount and LLW pigs had the lowest amount of intramuscular fat. All differences of intramuscular fat between LW and other breeds were statistically significant. Protein amount was similar for all breeds, except amount of LW and Y pig meat what was 0.48% ($P<0.05$). The amount of minerals in meat was similar for all breeds.

The analysis of indexes' varying features has shown that the differences of dry matter, pH and protein amount in meat were not very high among particular animals of the same breed. Water-holding capacity, b* value of meat colour, cooking loss had the higher varying inside the breed and meat toughness, drip loss and intramuscular fat had the highest varying inside the breed. Coefficients of intramuscular fat varying (C_v) were the highest from these breeds with what the intense selection was done according to the development of muscles. The coefficient of intramuscular fat varying (C_v) from LW pigs was 6.18, from L – 30.26, from Y – 37.71 and from LLW – 30.34. The high differences of intramuscular fat coefficients from different indexes of meat quality according pig breed were observed. The varying of the most indexes of meat quality inside the breed is significant higher than among breeds.

Conclusions.

1. Meat quality was not the same from investigated pigs. Meat color, water holding capacity and water binding had the highest differences among breeds.
2. Large White pig meat had the most intensive color and Landrace pigs had the least intensive meat color ($P<0.05$). Large White pig meat had the highest drip loss and Lithuanian White pig meat had the lowest drip loss ($P<0.001$). Lithuanian White pig meat had the highest water-binding capacity ($P<0.05$-<0.01).
3. The bigger variety of different meat quality indexes is observed inside the breed than among breeds.
4. The yellowness b*, meat water-binding capacity, drip loss, shear force and the amount of intramuscular fat varied the most inside the breed. This represents big possibilities for to carry out an effective selection for account of genetic recourses in the direction of meat quality improving.

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