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SEX-RELATED MUSCLE FIBRE THICKNESS AND HAM SLAUGHTER VALUE ANALYSIS

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ABSTRACT:

Ham consists of the three basic musculus. Two musculs have been chosen for the purpose of our analysis, these are first musculus semimembranosus and second musculus adjuctor. The study was conducted on 50 pigs of three different genotypes in the first test 12 there were (LWxL) x D), in the second 14 ((LWxL) x (DxPN)) and third 24 ((LWxL) x (HxPN)) carcass hybrid pigs used in Czech Republic were chosen for our research in 2001 – 2003. Those were used for subject to completed VJH experiments. Slaughter pigs with a slaughter weight of 105 kg. Individual muscle samples were measured and evaluated for their thickness. All of measurement results were processed by the SAS program.

Firstly, the average detected thickness of semimembranosus muscle fibres were 39,55 µm (test 1); 57,31 µm (test 2) and 45,14 µm (test 3) by female pigs and male pigs values were 39,16 µm; 52,47 µm and 48,32 µm. Secondly, the average detected thickness of adjuctor muscle fibres were 56,47 µm; 45,86 µm and 59,44 µm and male pigs values were 51,53 µm; 48,21 µm and 49,37 µm. The female pigs demonstrated a bigger muscle fibre thickness compared to male pigs values in two out of three tests. Significant differences were documented between muscle fibre thickness and level of partial index carcass value in carcass pigs.

Keywords: pigs, hybrids, diameter of muscle fibre, ham

INTRODUCTION

In the Czech Republic interest is aimed at production of quantity of pork meat but of course at the same time quality of pork meat is important. For this reason study was specialized in the problems of quality characteristics of pork meat with respect to character of muscle fibre

regarding the influence of hybrid pigs used in each test. Yearly average consumption of pig meat per one person in the Czech Republic was 40,9 kg in 2002.

There is a literary summary in brief about this topic. The muscle fibre of offspring of PLW x PL crossbred sow mated to XPU or AMBRE boars had large diameters and contained giant fibre, lowering the quality of meat (WU et al., 2002). For the ***MLLT*** in hybrid combination father-mother were the greatest muscle fibre diameter in the H x (L x SL) 67,3 µm and the smallest in the BL x (L x SL) 57,1 µm (PETROV et al., 1990). The results show differences in different types of muscle and also between normal muscle tissue and pale soft exudative muscle (GJURCEVIC-KANTURA, 1990). Muscle fibre of pigs (GL – boars) prone to PSE meat were approximate 10 % thicker ($P<0,05$) than those of non-PSE pigs at all monitored ages (WEGNER and ENDER, 1990). The halothane-positive L pigs had a higher diameter of red, intermediate and white muscle fibre by 17, 15 and 4 % respectively than the halothane-negative pigs, and a 5 % higher number of white fibre. The halothane-positive pigs also had a lower number of nuclei and number of capillaries per unit of muscle area by 26 and 12 % respectively than the halothane-negative pigs (FIEDLER et al., 1993). For all fibre types, fibre diameter was lowest for H and LW x L samples in comparison with H x PN. H pigs had the lowest percentage of white and the highest percentage of red fibre (FEDDERN et al., 1995). Larger diameters muscle fibre were notation in white fibre on the contrary red fibre (FISCHER a HOFFMANN, 1978; SIJACKI et al., 1994). On the other hand, both fibre number and fibre diameters are positively correlated with muscle mass and lean meat percatange (REHFELDT et al., 2000). Coefficient of heredity of muscle fibre diameter were 0,38-0,65 (LAHUCKÝ a UHRÍN, 1995). Sex significantly affected the muscle breadth, depth and area, and lean percentage (KUCHENMEISTER et al., 1993).

The objective of the work was to monitor the influence of the gender and slaughter weight of the fattened pigs on muscle fibre thickness. This project was supported by the CMEPt No. MSM 41 2100003 phase 03 and as a solution of external corporate grants.

MATERIAL AND METHODS

The study of the relationship between the muscle fibre thickness and live weight of pigs at the end of the research with regard to the gender. Individual muscle samples were taken as follows: m. semimembranosus (*MS*) from the caudal part of the leg, m. adjuctor (*MA*) from the cranial section of the leg, m. serratus ventralis (*MSV*) from the vertical part of the shoulder, m. cleidocephalicus (*MC*) from the cranial part of the neck, and m.

longissimus thoracis et lumborum (*MLLT*) from the cranial part of the joint. Characteristic muscle fibre were measured in 50 firm product hybrid pigs by means of a section preparation with a thickness of about 10 µm. Then, the fixation samples were washed in order to remove the fixation liquid from the samples (VACEK, 1961 and TICHÁ 1981). Water had to be completely removed from the samples before they were cast in parafin. Tissue dehydration was conducted by means of an ascending series of alcohols. The sections were dyed first with hematoxylin and then with 0,2 % erythrosin. The characteristic (thickness, area, perimeter and number) muscle fibre was measured by means of the LUCIA, version 4.71 program by Laboratory Imaging Co.

Results of individually monitored indicators were processed by the Analyses of Variance (ANOVA method). The differences among individual groups were tested by Scheff´s test in the SAS statistical program.

RESULTS

Sex and Genotype influence on the partial characteristics of carcass value

A trend is showing a better meat stock quality with sows as opposed to barrows. Sex signigicantly affected the muscle fibre characteristics and lean precentage. Muscle fibre of pigs prone to DFD meat were in the second experiment in the amount of 7 % and in the third experiment in the amount of 16 %. Monitored indicators showed a muscle fibre thickness thicker with the higher area and then lower weight of lean meat stock in sows in comparison with barrows concerning the individual carcass value. This trend was opposite in barrows. All genotypes have shown a trend of reduced variability in the monitored indicators in hybrid pigs within the three experiments.

Sows achieved bigger muscle fibre thickness in ***MS*** area and at the same time lower weight of meat with bone and fat. With barrows the trend was opossite. There was a significant trend of to lowered variability in observed signs.

Lean meat share of carcass body influence on the partial characteristics of carcass value

Musculus semimembranosus (***MS***)

Obtained values of sow average muscle fibre thickness in the tests firstly 51,2 µm, secondly 45,9 µm and thirdly 52,9 µm. With barrows there was detected these values 49,9 µm, 48,3 µm and 48,2 µm. The biggest sows muscle fibre thickness was observed (in tests 1 and 3) in comparison with barrows in the same order. There were measured values with sows average muscle fibre area in the tests 3105,4 μm^2, 2350,8 μm^2 and 2514,7 μm^2 with average

perimeter muscle fibre was measured 191,2 µm, 184,5 µm and 204,6 µm. With barrows there were measured values 3055,2 µm^2, 2495,8 µm^2 and 2293,7 µm^2 with average perimeter muscle fibre were measured 201,5 µm, 183,8 µm and 185,9 µm. The average number of muscle fibre per the area unit (141,739 µm^2) was detected as an interval of 31-45 by sows and barrows 31-43 (Fig. 1).

Musculus adjuctor (***MA***)

Observed values sows average muscle fibre thickness in the tests firstly 41,4 µm, secondly 52,6 µm and thirdly 53,4 µm. With barrows there was detected these values 40,6 µm, 50,6 µm and 46,7 µm. The biggest sows muscle fibre thickness was observed (in tests 1, 2 and 3) in comparison with barrows in the same order. There were measured values with sows average muscle fibre area in the tests 1817,3 µm^2, 2499,7 µm^2 and 2677,2 µm^2 with average perimeter muscle fibre was measured 151,2 µm, 203,5 µm and 194,2 µm. With barrows there were measured values 1655,1 µm^2, 2352,5 µm^2 and 2153,7 µm^2 with average perimeter muscle fibre were measured 149,4 µm, 194,9 µm and 179,1 µm. The average number of muscle fibre per the area unit (141,739 µm^2) was detected as an interval of 40-46 by sows and barrows 41-48 (Fig. 2).

CONCLUSIONS

The three completed experiments produced data that enable conclusions to be drawn on the relationship between characteristics of muscle fibre and characteristics of main meat parts sows in comparison with barrows:

- Meat stock composition of sows proved to be of better quality than that of barrows. The following was found, comparing sows to barrows: larger thickness of ***MS*** and ***MA***, higher percentage of lean meat stock, higher percentage of main meat parts, lower carcass weight.
- The biggest sows muscle fibre thickness (a total of 21074 muscle fibre measured) associated with the slaughter weight of 105 kg was observed 53,4 µm (***MA***) and barrows muscle fibre thickness was 50,6 µm (***MA***).
- The smallest sow muscle fibre thickness was observed 41,4 µm (***MA***) and barrows muscle fibre thickness was 40,6 µm (***MA***).
- The highest variability of fluctuating muscle fibre thickness was detected in ***MA*** (40,6 to 53,4 µm).

- The largest sows average muscle fibre area (a total of 19900 muscle fibre measured) associated with the slaughter weight of 105 kg was observed 3105,4 μm^2 (***MS***) and barrows 3055,2 μm^2 (***MS***).
- The smallest sows area was observed in ***MA*** (1817,3 μm^2) and barrows in ***MA*** (1655,1 μm^2).
- The highest variability of fluctuating muscle fibre area was detected in ***MS*** (2293,7 to 3105,4 μm^2).
- The largest sows average perimeter muscle fibre (a total of 20600 muscle fibre measured) associated with the slaughter weight of 105 kg was observed 204,6 µm (***MS***) and barrows average perimeter muscle fibre was 201,5 µm (***MS***).
- The smallest sows average perimeter of muscle fibre was observed 151,2 µm (***MA***) and barrows 149,4 µm (***MA***).
- The highest variability of fluctuating muscle fibre perimeter was detected in ***MA.***
- The average number of muscle fibre per an area unit (141,739 μm^2) was detected as an interval of 31-48.
- Barrows with a live weight of 105 kg was observed a higher variability of fluctuating characteristics muscle fibre than sows.

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