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Effect of terminal sire genotype on the carcass characteristics of the fattening pigs

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Abstract

The purpose of this study was to measure some of the carcass characteristics as meatiness, thickness of MLD and back fat in three different types of crossbred fatteners. Some of the characteristics of meat as color and pHi and pHu were also measured. All dams were the Yorkshire x Landrace and three different types of terminal sire (Duroc, Pietrain, Pietrain x Duroc). Immediately after farrowing, piglets were marked according to the crossbred which belonged. In total it was marked 188 (Yorkshire x Landrace x Duroc), 86 (Yorkshire x Landrace x Pietrain) and 443 (Yorkshire x Landrace x x Duroc) piglets. All piglets were reared on the same farm in the same condition. At the end of the fattening period the pigs were slaughtered at the local abattoir. In total 120 carcasses were measured. The results showed that the highest value of meatiness had the fatteners crossbred Yorkshire x Landrace x Pietrain on average 60.19%, while other two types of crossbred had the meatiness 59,06% and 58,61% (Yorkshire x Landrace x Duroc; Yorkshire x Landrace x Pietrain x Duroc) . The pHi, pHu and color of the meat derived from three types of crossbreed were very similar and there were no statistically significant differences.

Key words: terminal sire, carcass characteristics, fatteners

Introduction

The Republic of Serbia is a country with the estimated production of 3 million of pigs per year (Statistical Yearbook of the Republic of Serbia, 2021). The number of pigs has been in continuous fall in the last two decades. The data from 2006 showed almost 4 million produced

pigs per year. It is a well-known fact that the biggest pig production in the Republic of Serbia was during the mid-1980s (Jeremić et al., 2018) when the export of pork meat was very developed. By the annual number of produced pigs, the Republic of Serbia is on the 11th place in Europe and ahead of some of the well-known traditional pig producing countries such as Hungary, Czech Republic, Bulgaria, Slovakia, Croatia (eurostat, 2019). Almost all ex-communist countries in Europe had the shrinking in the numbers and reduction in the pig production. The reduction of import taxes and opening of the markets in these countries in majority cases lost the competitiveness of their own production. The Republic of Croatia is an example of the former big pig producers in the ex-SFRJ Republic. In the last two decades the pig production has been reduced and from exporters this country became one of the big importers of pig meat and live pig for slaughter (Sviben, 2005). Moreover, even when the fatteners are produced it is done from imported piglets

The Republic of Serbia, especially Vojvodina, its North part, has almost the ideal condition for intensive pig production (Lierop et al., 2015). Currently the most prominent agricultural export is export of crops such as corn, instead of meat or meat products. During the good years Serbia has been one of top ten corn exporters in the word (USID, 2019).

The breeding program for pigs in AP Vojvodina is organized through the Main breeding organization for AP Vojvodina. The number of sows and boars under the control is in the continuous increase from 2013 (data from the https://www.stocarstvo.edu.rs/centar).

The lean meat content is an important characteristic of produced fatteners; the heritability for carcass quality is very high (Radović et al., 2020). However, the carcass classification of pigs is not adequately implemented into the payment of produced fatteners. The SEUROP standard of classification is used in EU countries. It was developed from the need to compare the price of pig's carcasses in EU member states. In the Republic of Serbia, the standard in partial use is from 1985, JUS standard (Petrović et al., 2009). There is not much data regarding the average lean meat content of the produced fatteners in the Republic of Serbia. One of the reasons is non-existence of permanent monitoring of lean meat content of fatteners. Another reason is outdated legislation which is currently in partial use. Comparing SEUROP standard and JUS standard meat content on the same carcasses was between 9.98% to 12.97% (Radović et al., 2020). The average lean meat content of carcasses (65,764) measured in the eight slaughterhouses in Vojvodina was 55.31% (Radović et al., 2021). In the research done in 2011 on 12.523 carcasses the average lean meat content was 52.29±2.04% (Dokmanović et al., 2013). However, there are huge differences in meatiness depending on the chosen method and device. Therefore, it is very hard to compare data and draw a conclusion on the average

meatiness of slaughter fatteners. The aim of this study was to investigate the differences in quality of carcass and meat of the fatteners depending on the crossbreed, with the special point on the meatiness.

Material and Methods

Fatteners

The research was carried out on a farm in Vojvodina with a capacity of 1,600 sows. The farm has a complete production cycle from sows to fatteners and the farm does the selection of pure breeds to produce F1 gilts. The study included piglets-fatteners obtained from F1 generation sows and different terminal sire (Yorkshire x Landrace x Duroc; Yorkshire x Landrace x Pietrain; Yorkshire x Landrace x Pietrain x Duroc). For the purpose of this research piglets at the birth were marked depending on its crossbreed. In total it was marked 188 (Yorkshire x Landrace x Duroc), 86 (Yorkshire x Landrace x Pietrain) and 443 (Yorkshire x Landrace x Pietrain x Duroc). All fatteners were raised in the same premises and fed the same feed. The hogs' diet was based on the locally produced corn and soybean meals and was formulated to meet the animals' nutritional needs. The fattening of the hogs was divided in three phases: the starting, growing and finishing periods. After the end of the fattening period, when they were approximately six months old, they were taken in the local abattoir. In total 120 carcasses were measured for the purpose of this study.

Meatiness

The qualified operators performed the classification of pig carcasses. The operators had finished the training courses in Norway, in the agency for classification 'Nortura', and in Italy, in the organization of the Italian Ministry "Ministero delle Politic he Agricole Alimen- tary e Forestali" for which they received certificates. The lean meat content was measured on the slaughter line 45 minutes post mortem with the one-point puncture model. The measurement was carried out with an optoelectronic probe for the classification of pig carcasses CLASSPRO GmbH (Germany). The puncture was 7 cm from medial carcass line, between 3rd and 4th rib, from cardocranial point of view, perpendicularly to the carcass.

Ph

The initial and ultimate meat pH (pHi and pHu) of the musculus longissimus dorsi were measured using a pH meter (Testo 205, Testo AG, Lenzkirch, Germany). Meat pH were determined in triplicate, and the average values of three measurements were taken as a final result.

The color of meat

Instrumental pork color measurements were determined at 24 h postmortem after a standard 30 min blooming period by using NR110 Precision Colorimeter. Measurements were made by taking seven readings (technical replicates) on the surface of each meat sample. The average L*, a* and b* values of several measurements were taken as a final result.

Statistics

The basic descriptive statistical data analysis was done by using the software package TIBCO® Data Science Statistica™ 14 released in 2020 (TIBCO Software Inc., Palo Alto, California) The statistical significance of the differences between the mean values was determined using the t-test.

Results and Discussion

The carcass weights (average 85.15±1.25 kg), live weights (average 108.13±14.29) and cooled carcass weights (average 83.87±11.08) of all measured carcasses were very similar and there were no statistical differences (table 1). However, there were statistically significant differences on meatiness, MLD (M. longissimus dorsi, mm) and fat thickness on the back (mm). The highest value of meatiness had the fatteners crossbreed Yorkshire x Landrace x Pietrain, average 60.19%, while other two types of crossbred had the average 59.06% and 58.14%. The similar results were for the thickness of MLD, the highest value had the fatteners crossbreed Yorkshire x Landrace x Pietrain 62.52 mm and the smallest thickness of beck (12.91 mm).

Table 1. Meatiness and carcass characteristics of fatteners depending of terminal sire

crossbreed	YL*P	YL*D	YL*PD	∑
number	40	40	40	120
Carcass weight (kg)	85.76±2.59	85.41±2.15	84.48±1.16	85.15±1.,25
Live weight (kg)	108.91±13.96	108.48±15.18	107.87±14.17	108.13±14.29
Cooled carcass weight (kg)	84.47±10.83	84.14±11.77	83.66±11.01	83.87±11.08
Meatiness (%)	60.19±2.99[a]	59.06±2.78	58.14±3.43	58.61±3.30
MLD (mm)	62.52±6.80[a]	56.71±8.27	56.31±6.94	57.20±7.48
fat thickness on the back (mm)	12.91±3.36[a]	13.11±2.92	14.10±3.69	13.73±3.50

Legend: Y- Yorkshire, L- Landrace, P- Pietrain , D-Duroc

[a]- significantly differ at p=0.05

These results are in agreement with some previous research. The Kušec et al. (2004) found that the carcass of three way crossed fatteners with the Pietrain as a terminal sire to have lean meat

on average 62.11%. Similarly, Edwards et al., 2003 found Pietrain progeny had a higher percentage of lean meat at slaughter than Duroc progeny.

Table 2. The color of meat, pHi and pHu

crossbreed	YL*P	YL*D	YL*PD
color			
L^*	43.46	42.65	43.71
pH			
phi	6.11	6.04	6.09
pHu	5.73	5.77	5.81

Legend: Y- Yorkshire, L- Landrace, P- Pietrain , D-Duroc

In table 2 are present results for the color and pH of pigs meat. There were no statistically differences between the groups. The results indicated that the quality of meat is very similar between the crossbreed fatteners. This results are in agreement with some previous research (Jokanović et al., 2015).

From this results it seems that Pietrain as terminal sire give the fatteners with the highest lean meat content without undesirable meat characteristics. Meatiness and meat quality is one of the characteristics which are important in production of fatteners. For some of another characteristic important for production as survival rate in the condition on farms is better duroc as terminal sire (Pedersen et al. 2019). Moreover in research of Vidović et al. (2011) showed significantly less gain and needed longer period to reach a certain weight for the genotype of Pietren.

Conclusion

On the basis of the investigation of carcass and meat quality of crossbred fatteners originated from three different types of terminal sire it can be concluded that: The highest value of meatiness was observed in fatteners crossbred with Pietren as terminal sire, in average 60.19%. The thickness of MLD (mm) was also the highest in those fatteners and the lowest thickness of fat on the back. The quality of meat color, pHi and pHu were very much similar in all meat regardless of the crossbreed.

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