



Influence of terminal sire breed on carcass and meat quality traits of pigs

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ABSTRACT

The carcasses of 53 pigs were included in this study. They were divided in two groups according to the breed of the terminal sire as follows: 28 progenies of Large White and 25 progenies of Pietrain sire. Dams were all Large White×Swedish Landrace crossbreeds. Sire line had no influence on cold carcass weight, length and fat thickness measured as in “two points” (TP) method of lean percentage estimation, as well as on ham length and ham index ($P>0.05$). On the other hand, carcasses of the pigs originated from Pietrain sires had significantly higher thickness of MLD measured as in both TP and instrumental (FOM) method of lean percentage estimation, while fat thickness measured at the place of FOM method was significantly lower ($P<0.01$). These carcasses had also higher estimated lean percentage, ham circumference and ham weight ($P<0.01$). Although progeny of Pietrain sires performed better regarding the carcass traits, their meat quality was inferior compared with the meat of the pigs originated from Large White sires. The value of pH_{45} of the pigs originated from Pietrain sires was significantly lower, at the border of PSE meat, and Minolta L^ values indicated significantly paler color than in the case of Large White crosses. Crosses with Pietrain had, however, higher MLD surface and fat/muscle ratio ($P<0.01$) than Large White crosses. Other meat quality traits, such as pH_{24} , water holding capacity, consistency and fat surface, were unaffected by the breed of terminal sire.*

(Keywords: pig, breed, carcass, meat quality)

INTRODUCTION

The choice of sire is important decision in every breeding program because it determines main performances of fatteners in production of pork such as growth, carcass and meat quality. These traits are also of great economic importance, but still seldom recorded in routine selection programs in Croatia. This results in the constant lack of information for the choice of optimum breeds of sires to be used in Croatian pig production. Some of these information can be found in scientific literature, some from the experience of pig breeders from other countries, but it is important to know that breed effects are not fixed. They can differ from region to region and even among different producers within the same local area. These differences result from various attempts of pig breeders to achieve various selection goals with also various success. Therefore, it is very important to have an overview of the available information on the breeds of potential sires and their influence on production traits of their progeny, i.e. crossbred slaughter pigs in the local production environment. For this purpose, sires used in production of pork should

be tested on main carcass and meat quality characteristics, and the results of these tests should be known to the producers of fattening pigs.

The objective of this article is to investigate the influence of terminal sire breed on carcass and meat quality traits of slaughter pigs produced in east Croatia.

MATERIALS AND METHODS

This study was performed on 53 carcasses of three way crossed castrated pigs divided into two groups regarding the breed of the terminal sire. The dams were all double crossbred: Swedish Landrace×Large White, while Pietrain and Large White boars were used as terminal sire. Pietrain group had 25 and Large White group included 28 pigs. The pigs were slaughtered at approximately 100 kg live weight in “Sotin” slaughter plant VUPIK, Vukovar. At the slaughter line, the measurements of carcass length, fat thickness and muscle depth, muscle and fat surfaces of *m. longissimus dorsi* between 13th and 14th rib and pH₁ values were taken on primarily processed swine carcasses. Backfat thickness - TP (mm) was measured caudally at the place where *m. gluteus medius* gets the deepest in the subcutaneous fat, and muscle depth (mm) measured as the shortest distance between the cranial end of *m. gluteus medius* and dorsal spinal edge. Backfat thickness and muscle depth – ins (mm) were obtained from the instrumental method of lean percentage estimation by Fat-o-Meter (FOM). The length of the carcass was measured from *os pubis* to the 1st rib (a) and from *os pubis* to *atlas* (b). The lean percentage was calculated on the basis of “two points” and instrumental method of estimation. After 24 hours of cooling, cold carcass weight, backfat and muscle area (cm²), pH₂₄ values, water holding capacity (w.h.c.), consistency and color of *m. longissimus dorsi* were taken. Backfat and muscle areas were measured by geometric procedure (Comberg, 1978) using digital planimeter “HAFF 350 E” and expressed as the fat/muscle area ratio; water holding capacity (w.h.c.) was determined using compression method by *Grau and Hamm* (1952). The consistency was expressed here as the area of the compressed muscle tissue (cm²) obtained in the procedure of taking wh.c. measurement. This is a modified method and it is used only to compare the samples taken from different populations. The color of the meat was measured by “Minolta CR-300” device at *m. longissimus dorsi* cut. The measurements of pH₄₅ and pH₂₄ were carried out by digital pH-meter “Mettler MP 120-B”. Statistical analysis was performed using STATISTICA (5.0) for Windows program.

RESULTS AND DISCUSSION

It is obvious from *Table 1* that sire line had no influence on cold carcass weight, length and fat thickness measured as in “two points” (TP) method of lean percentage estimation, as well as on ham length and index ($P>0.05$). On the other hand, carcasses of the pigs from Pietrain group had significantly higher thickness of *m. longissimus dorsi* measured as in “two points” and instrumental (FOM) method of lean percentage estimation, while fat thickness, measured at the place of instrumental method was significantly lower ($P<0.01$) than in the carcasses from Large White group of pigs. These carcasses had also higher lean percentage estimated by both “two points” and instrumental method ($P<0.05$ and $P<0.01$, respectively). Although the ham length of both groups of pigs were approximately the same, Pietrain sire progeny had significantly higher ham circumference and ham weight ($P<0.01$) suggesting more intensive development of hams of the pigs from this group. In general, linear carcass

measurements indicate better carcass characteristics of the pigs with Pietrain as terminal sire breed. Contrary to present study, *Hamilton et al.* (2001) found significant effect of sire line on hot carcass weight, but no influence on carcass length which is in agreement to the results presented here. Sire line had significant effect on both hot and cold carcass weight, while no influence on carcass length, fat measurements and lean percentage was found by *Miller et al.* (2000). Similar results reported *Leach et al.* (1996) who found significant differences between the two sire lines in cold carcass weight and no differences in lean meat percentage, carcass length and fat measurements. However, these differences were influenced by different MHS-genotype of the sire.

Table 1**Differences in carcass traits between crossbred pigs with different terminal sire**

Carcass trait	Pietrain	Large White	Level of significance
Cold carcass weight, kg	78.56	75.75	n.s.
Carcass length "a"	88.68	88.86	n.s.
Carcass length "b"	103.16	103.68	n.s.
Fat thickness (TP), mm	16.60	19.57	n.s.
MLD thickness, (TP), mm	70.48	63.71	P<0.01
Lean percentage (TP), %	55.21	52.06	P<0.05
Fat thickness (ins.), mm	13.20	16.32	P<0.01
MLD thickness, (ins.), mm	61.60	53.79	P<0.01
Lean percentage (ins.), %	57.60	53.60	P<0.01
Ham length, cm	31.68	31.25	n.s.
Ham circumference, cm	71.06	68.52	P<0.01
Ham weight, kg	11.32	10.49	P<0.01
Ham index	44.65	45.66	n. s

n.s.: not significant ($P>0.05$)

Although progeny of Pietrain sires performed better regarding the carcass traits, their meat quality was inferior compared with the meat of the pigs originated from Large White sires. Meat quality traits are presented on *Table 2*.

Table 2**Differences in meat quality traits between crossbred pigs with different terminal sire**

Trait	Pietrain	Large White	Level of significance
pH ₄₅	6.04	6.28	P<0.01
pH ₂₄	5.66	5.73	n.s.
w.h.c.	10.23	9.87	n.s.
Consistency	3.25	3.23	n.s.
Minolta L*	54.58	51.99	P<0.01
Minolta a*	7.70	6.56	P<0.05
Minolta b*	7.25	5.67	P<0.01

n.s.: not significant ($P>0.05$)

From the data presented it is obvious that pH₄₅ values measured in the loin muscle of pigs from Pietrain group were significantly lower, at the border of PSE meat indicating faster glycolysis flow in the muscles of these pigs compared to the pigs from Large White group. Ultimate pH values of the pork from Pietrain group were also lower but this difference was not significant ($p>0.05$). However, it should be stated that the mean pH₂₄ value measured in the meat of pigs from Pietrain group was below the border value for PSE meat (5.7) suggested by *van Laack* (2000). Nevertheless, *Forrest* (1998) reported that pH₂₄ of 5.5 or lower would result in 99% of PSE pork, but when this value is above 5.65 there will be almost no PSE, although drip loss may be variable. By this criterion mean ultimate pH measured in the meat of pigs from Pietrain group would be almost at the border of PSE condition. Minolta L* values indicated significantly paler color of the meat of pigs from Pietrain than in Large White group. According to *van Laack* (2000), PSE meat is characterized by L* values above 58 which means that both groups of pigs from current study had normal meat brightness. Although PSE condition of pork is often induced by MHS gene, number of authors reported lowered meat quality of pork in Pietrain based crossbreeds, independently of MHS gene status (*Howard and Smith*, 1977; *Oliver et al.* 1993; *Hamilton et al.* 2001). Since MHS gene status of Pietrain sires used in this study was not determined, it is not known whether the reduced meat quality resulted from the effect of MHS gene. This demonstrates that MHS genotype of the boars used as sires in commercial crossings must be known which is not always the case in east Croatia. Statistically significant differences between two groups with different sire lines were also found for Minolta a* and b* values ($P<0.05$ and $P<0.01$, respectively). Water holding capacity and consistency were unaffected by the breed of terminal sire.

CONCLUSIONS

From the present study on influence of terminal sire breed on the carcass traits and meat quality of fattening pigs, following conclusions can be drawn:

- The breed of terminal sire significantly influenced some carcass traits. Pigs originated from Pietrain sire had significantly higher MLD thickness measured as for TP and instrumental method of lean percentage estimation ($P<0.01$); lower fat thickness measured as for FOM method ($P<0.01$); higher lean percentage estimated by TP and instrumental method ($P<0.05$ and $P<0.01$, resp.); higher ham circumference and weight ($P<0.01$) than the progeny of Large White terminal sires.
- Meat quality traits of the pigs originated from Pietrain sires had less favourable values compared to progeny of Large White terminal sire. Their pH₄₅ was significantly lower ($P<0.01$), while Minolta L* values indicated significantly paler meat color ($P<0.01$) than in the muscles of pigs from Large White group.
- The inclusion of Pietrain boars as terminal sires can improve the muscularity of fattening pigs but they can also reduce the quality of meat.

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