



Short communications

## Quality Characteristics and Chemical Composition of *M. Longissimus thoracis* in Crossbred Pigs

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### Abstract

The study aimed to compare the quality characteristics and chemical composition of *m. Longissimus thoracis* (m. LT) in two-way pig crosses – Duroc x Landrace (D x L) and Pietrain x Landrace (P x L). The differences in the quality parameters of the examined groups were insignificant. The moisture and protein content tended to be lower in the muscles of D x L compared to P x L. Furthermore, the fat content of the Duroc cross also appeared to be higher, however the differences were insignificant.

The quality traits of m. LT, including pH 45, pH24, water-holding capacity (WHC) and colour were within the optimal range and did not show any deviation from the standards for the “normal” meat.

**Keywords:** Pigs, Two Way Crosses, Quality Of *M. Longissimus Thoracis*.

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## INTRODUCTION

The term "meat" means the flesh or other edible parts of the animal, fresh or processed, that are suitable for human consumption. In a much narrower sense, meat is the muscles of the animals including connective tissue components, intra- and intermuscular fat, blood vessels, lymph nodes, nerves and bones (Pipek, 1995).

The quality of meat and its nutritional value depend on the ratio of the individual components (Culioli et al., 2003). The main component of meat is the muscle tissue containing approximately 75% water, 20% protein, 3% lipids, 1% carbohydrates and 1% vitamins and minerals. According to Pettigrew and Esnaola (2001), protein is about 80% of the dry matter in the muscle tissue. The available literature provides no uniform definition for high meat quality used in meat industry. Meat quality combines subjective and objective parameters, that are different for the different markets. Colour, pH, WHC, marbling are some of the most often used traits when determining the quality of meat. According to Hambrecht (2004), the healthy and ethical qualities might be as important as the technological and sensory properties of meat. All of them form a certain part of the definition for the meat quality.

According to Klimas and Klimienė (2001) and Jukna et al. (2003), the quality characteristics of pork are mainly influenced by the origin, individual features of the pigs, the rearing and feeding strategies, the capacity and the maximum use of their genetic potential for producing of high quality and competitive products.

With this study, we aimed to examine the quality traits of meat in two-way crosses of pigs reared in industry.

### Material and Methods

The study was carried out in "Golyamo Vranovo Invest" pig farm with a random sample of 20 finished gilts as presented in Table 1.

**Table 1.** Scheme of experiment

<b>Group 1</b>	<b>Group 2</b>
Duroc x Landrace (DxL) N= 10 (10♀)	Pietrain x Landrace (PxL) N= 10 (10♀)

During the finishing period, the animals were reared into group boxes according to the requirements of Regulation 21/14.12.2005 for the minimum requirements for protection and welfare for pigs reared under systems when feed and water are provided ad libitum. The gilts were slaughtered, the carcass processing were done through skinning according to traditional technology with vertical separation of the skin. The carcass weight in both groups was as follows: Group 1 (DxL) – (71.04 ±0.32 kg) and Group 2 (70.56±0.43 kg).

The evaluation of the physicochemical composition and quality characteristics of m.LT was done through measurement of pH 45min *post mortem*, pH 24h *post mortem*, fat content (Soxhlet), protein content (Kjeldal), moisture and ash. The WHC was determined according to the method of Grau и Hamm (1952); the colour of the meat (R/525nm) was measured as described by Pinkas (1981). Possible muscle damage caused by stress were determined through the method described by Warriss, (2000) (presented in Table 2).

**Table 2.** pH of *m. Longissimus thoracis* for PSE, normal and DFD meat (Warriss, 2000).

Category	pH45min	pH24h
PSE	<5.8	<5.3
Normal	5,8-6,4	5,3-6,0
DFD	>6.4	>6.0

Data were statistically evaluated applying General Linear Model (GLM) procedure in SPSS statistical software. Differences between the means were evaluated through t-test and considered significant at  $P < 0.05$ . The results are presented as mean, standard error of the mean (SEM) and variation coefficient (C).

### Results and Discussion

The initial and ultimate pH values are important indicators for the degree of protein denaturation in fresh pork. The results of our study (Table 3) did not show any deviation from the parameters of “normal” meat (Warriss, 2000). In both groups pH45 (6.18, 6.16), pH24 (5.86, 5.85) and WHC (25.23%, 24.98%) did not differ significantly ( $P > 0.05$ ). The R/525nm value of the muscle in pigs from Group 1 is higher when compared to Group 2, indicating lighter colour for the Duroc cross, however the difference was not significant ( $P > 0.05$ ). The trend toward lighter colour corresponds to the higher intramuscular fat content in this cross. When studying different genotypes, Berg et al. (2003) found that the meat of crosses with participation of Duroc exhibited higher content of intramuscular fat and ultimate pH values. Other studies reported considerably higher values of pH45min (Jeleniková et al., 2008) and pH24h (Gjerlaug-Engeret al., 2010; Li et al., 2013) in the muscles of purebred Durocs in comparison with non-pigmented breeds.

**Table 3.** Chemical composition and quality characteristics of *m. Longissimus thoracis*

Item	Group 1			Group 2			Sig.
	Mean	SEM	CV,%	Mean	SEM	CV,%	
<b>pH45min</b>	6.18	0.03	1.65	6.16	0.02	1.16	NS
<b>pH24h</b>	5.86	0.02	1.39	5.85	0.02	1.00	NS
<b>Colour (R/525nm)</b>	25.29	0.60	7.15	24.57	0.86	10.55	NS
<b>WHC,%</b>	25.23	0.54	6.53	24.98	0.70	8.47	NS
<b>Moisture, %</b>	73.46	0.67	7.65	75.80	0.72	8.02	NS
<b>Protein,%</b>	23.40	0.58	7.50	24.20	0.72	9.04	NS
<b>Fat,%</b>	1.98	0.14	21.34	1.79	0.16	27.79	NS
<b>Ash,%</b>	1.12	0.03	8.91	1.15	0.04	10.91	NS

NS- non-significant ( $p>0.05$ )

The fat in the muscles affect directly the flavor of the meat (Shi-Zheng and Su-Mei, 2009). According to Wood et al. (2008), in the modern breeds, as a result of selection oriented towards the increase of the lean meat in the carcass, the intramuscular fat decreases below 1%. The increase of the lean meat percentage contributes to development of pathological changes in the microstructure of *m. Longissimus lumborum*, which can reduce the quality of the meat (Wojtysiak, 2012). For acceptable taste of pork, it is recommended the intramuscular fat content to be within the range of 2%-4% (Verbeke et al., 1999). Fernandez et al. (2000) recommended 2.5% – 3.5% fat in the pork. According to Obadálek (1999), the total content of intramuscular fat should be between 1.6 % and 2%, as below this limit the culinary qualities of pork deteriorate. Ingr (2005) considered that fat content below 2% caused lower juiciness of pork which is unfavourable from both visual and culinary point of view. The high levels of intramuscular fat, however, lead to increased cooking losses (Cannata et al., 2010).

In Duroc crosses the fat content is higher when compared to Group 2. This indicates that the participation of Duroc as maternal in the crossbreeding schemes affects favourably the phenotypic display of this trait. Similar conclusion was made by Pöldvere et al. (2015) as well. According to Wood et al. (2004) the easiest way to optimize the levels of intramuscular fat is to use Duroc in crossbreeding. High fat content in *m. Longissimus thoracis* of Durocs was reported by Franco et al. (2014) and Choi et al. (2014). The results of our study show that the intramuscular fat is the most variable component of meat. The variation coefficient is several times higher than those of the other characteristics (21.34% and 27.79%, respectively for Group 1 and Group 2). Similar variations for the intramuscular fat were reported by Jukna et al. (2007).

The moisture and protein contents were lower in the DxL pigs in comparison to PxL, however the differences are insignificant ( $P>0.05$ ).

## Conclusions

The differences in the quality parameters of meat in the two way pig crosses (Duroc x Landrace and Pietrain x Landrace) were insignificant. The moisture and protein content tended to be lower in the muscles of DxL when compared to PxL pigs, however the content of intramuscular fat in the crosses of Duroc appeared to be higher. The quality traits of *m. Longissimus thoracis*- pH 45min, pH24h, WHC and colour were within the optimal range and did not show any deviations from the standards for the “normal meat”.

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