CHEMICAL AND FATTY ACID COMPOSITION OF THE *MUSCULUS LONGISSIMUS* OF MANGALITSA BREED

Imrich I., Mlyneková E., Mlynek J., Borsos A., Bučko O., Kanka T., Rolinec M.

Slovak University of Agriculture in Nitra, Slovakia

Abstract

The aim of the experiment was to assess the chemical and fatty acids composition of the Musculus Longissimus of the White Mangalitsa breed. In the experiment, we used 10 pigs of the breed White Mangalitsa with a live weight, at slaughter, 110 -130 kg. The animals were housed in the stall in the group pens with the full concrete flooring and bedding. The pigs were fed *ad libitum*. In addition to the complete feed mixture, the mixture of corn and clover-green silage was administered to the animals at a ratio 1:1. Samples for analysis of the fatty acids were taken from the *Musculus longissimus lumborum et thoracis* (MLLT). The water content in the MLLT meat was 72.68 ± 0.63 %. The content of protein ranged from 23.37 to 24.87 % and the intramuscular content of fat was 2.09 ± 0.61 %. The results from fatty acid analysis show that there was the highest content 51.19 ± 1.08 % of the monounsaturated fatty acids (MUFA), a lower content 35.33 ± 0.88 % of the saturated fatty acids (SFA), and the least content 12.50 ± 0.96 % of the polyunsaturated acids (PUFA). PUFA in the meat of pigs were mainly made by n-6 fatty acids (n6 PUFA: 11.06 ± 1.02 %, n3 PUFA: 0.62 ± 0.03%) and the n6/n3 ratio was 17.94. The content of cholesterol was 45 ± 11.44 mg.100g^{-1}. Compared to commercial breeds, the breed Mangalitsa is characterized by a more favorable composition of individual groups of fatty acids in intramuscular fat and the n6/n3 PUFA ratio.

Key Words: Cholesterol, fatty acids, intramuscular fat, mangalitsa, meat

Mangalitsa is a typical representative of the fatty breeds of pigs. This means that proportion of the meat is only 30 - 35 % from the total body weight (Egerszegi et al., 2003). The meat of Mangalitsa has a high content of fat, is darker, more juicy and much softer than the flesh of other pig breeds (Flegler, 1999). The meat of Mangalitsa contains less cholesterol and more unsaturated fatty acids compared to other breeds (Steffen et al., 2008). Csapó et al., 1999; Csapó et al., 2002 found out that the content of unsaturated fatty acids of the lard of Mangalitsa and its cross breeds was by 60 % higher than in other breeds. However, the differences in the content of cholesterol were not recorded. Regular consumption of SFA with the long chain increases the level of cholesterol, especially the LDL cholesterol, which has a significant atherogenic potential and is associated with an increased mortality rate regarding the ischemic heart disease (Žák, 2011). Occurrence of the SFA mostly prevails in the food of animal origin. They mainly occur in the fat of animals (Keresteš, 2011). Eating a diet that has a higher content of fat, but a low content of SFA, reduces the risk of cardiovascular diseases in the population (Kris-Etheerton, 1999). According to Dostálová (2011), the main positive effects of PUFA are considered reduction of the total blood cholesterol, anti-inflammatory, antithrombotic effects and blood pressure release. The most suitable ratio of PUFA n-6/n-3 for the human body is 1:1. However, inhabitants of the more economically advanced world receive foodstuffs in the ratio 15:1 to 16:1. Such a high amount of n-6 PUFA in the diet increases the risk of cardiovascular diseases, cancer, inflammatory and autoimmune diseases (Simopoulos, 2002).

Material and Methods

In the experiment, we used 10 pigs of the breed White Mangalitsa with a live weight, at slaughter, 110 -130 kg. The animals were housed in the stall in the group pens with the full concrete flooring and bedding. Automatic feeders for dry feed and two pin feed-pumps got part of the pens. The temperature of the object during the fattening period was maintained at 18 - 20 °C. The pigs were fed *ad libitum*. In addition to the

complete feed mixture, the mixture of corn and clover-green silage was administered to the animals at a ratio 1:1. The basic nutritional composition is shown in Table 1.

Samples for analysis of the chemical composition of the meat and fatty acids of the intramuscular fat were taken from the longest spinal muscle (*Musculus longissimus lumborum et thoracis* - MLLT) in the area of the last thoracic vertebra weighing 100 g. Chemical parameters such as the percentage of water, protein, intramuscular fat and the content of cholesterol, as well as fatty acid composition of MLLT, were measured by the FT IR method (Fourier Transform InfraRed) using the Nicolet 6700 device.

The experimental data were statistically processed by Microsoft Excel.

Table 1. Nutritional Composition of Feed Used in the Fattening of Pigs

	Feed Mixture	Mixture of Silage
Crude protein (g)	164.63	165.08
Crude Fat (g)	36.25	25.79
Crude Fibre (g)	48.89	262.63
Metabolisable energy (MJ)	13.10	2.88
SFA (%)	30.82	19.97
MUFA (%)	29.31	10.72
PUFA (%)	37.68	58.90
n6/n3 ratio	12.67	0.74

Results and Discussion

Results of the MLLT meat composition are shown in the Table 2. The water content in the MLLT meat was 72.68 ± 0.63 %. Similar results have also been found by Holló et al. (2003). Depending up on the weight, they found the proportion of water from 68.8 % to 69.0 %- in the muscle of the breed Mangalitsa. However, Parunović et al. (2013) have reported the lower content of water 62.7 % in the meat of White Mangalitsa and 64.3 % in the meat of Swallow-Bellied Mangalitsa. The content of protein ranged from 23.37 to 24.87 %. Similarly, Debrecéni et al. (2017) found the protein content in the meat of Mangalitsa on the level of 24.15 ± 0.66 %. Pugliese et al. (2005) have also found the content of protein from 22.8 % to 23.5 % in the meat of the local Italian pig breed Cinta Senese. But, for example, Parunović et al. (2013) have shown a significantly lower content of protein (19.5 %) in the White Mangalitsa. We have found the intramuscular content of fat ranging from 2.09 ± 0.61 %. It was significantly less than it had been declared by other authors. Petrović et al. (2010) report the fat content of Mangalitsa at 13.24 %, Ender et al. (2002) at 9 %. The by us identified content of minerals (0.86 ± 0.20 %) is comparable with findings of other authors. Parunović et al. (2013) discovered the content of mineral substances in the meat of Swallow-Bellied Mangalitsa at 0.95 % and 0.89 % in the breed of White Mantgalitsa. Petrović et al. (2010) have reported the average ash content at 0.96 % in the Mangalitsa breed.

Table 3 shows the basic composition of the fatty acids and the content of cholesterol in MLLT of the White Mangalitsa. The results related to MLLT meat show that there was the highest content 51.19 ± 1.08 % of the monounsaturated fatty acids, a lower content 35.33 ± 0.88 % of the saturated fatty acids, and the least content 12.50 ± 0.96 % of the polyunsaturated acids. A similar composition of the basic groups of fatty acids in the pork of commercial hybrids is also reported by Gerber (2007), namely: the content of monounsaturated fatty acids 40.1 %, saturated fatty acids 48.4 %, and polyunsaturated fatty acids 11.2 %. In contrast to our results, Parunović et al. (2013) found out that the content of PUFA was 7.01% in the Swallow-Bellied Mangalitsa and 5.61% in the White Mangalitsa.

As shown by the results of our work, PUFA in the meat of pigs were mainly made by n-6 fatty acids (n6 PUFA: 11.06 ± 1.02%, n3 PUFA: 0.62 ± 0.03%) and the n6/n3 ratio was 17.94. Debreceni et al. (2017) found this ratio at the level of 18.28. It is shown from the results of Parunović et al. (2013) that the best ratio n6/n3 PUFA was seen in the Swallow-Bellied Mangalitsa (14.05), then in the White Mangalitsa (34.01) and the worst was recorded in the Swedish Landras (45.63).

The content of cholesterol was 45 ± 11.44 mg.100g^{-1} (Table 3). In accordance with our results, Debreceni et al. (2017) have also found the level of cholesterol in MLLT in Mangalitsa at the level of 43.12 mg.100g^{-1}. Parunović et al. (2013) compared the content of cholesterol in MLLT in different pig genotypes. They have found out an evidently lower cholesterol level in the Swedish Landrass (47.1 mg.100g^{-1}) compared to the Swallow-Bellied Mangalitsa (62.3 mg.100g^{-1}) and the White Mangalitsa (62.9 mg.100g^{-1}). Similarly, Petrović et al. (2010) have found that the cholesterol level in MLLT in the Swallow-Bellied Mangalitsa is 61.82 mg.100g^{-1}.

Table 2. Chemical Composition of the White Mangalitsa Meat in Musculus Longissimus Lumborum et Thoracis (MLLT)

Indicator (%)	x	min	max	s	v%
Protein	24.37	23.90	24.87	0.35	1.42
Fat	2.09	1.35	3.04	0.61	29.03
Water	72.68	71.36	73.35	0.63	0.86
Ash	0.86	0.57	1.09	0.20	23.04

x – mean, min – minimum, max – maximum, s – standard deviation, v% - variation coefficient

Table 3. Content of the Fatty Acids and Cholesterol in Musculus Longissimus Lumborum et Thoracis (MLLT) in the White Mangalitsa

Indicator	x	min	max	s	v%
Fatty acids (%)					
SFA	35.33	34.13	36.62	0.88	2.49
MUFA	51.19	49.27	52.25	1.08	2.10
PUFA	12.50	10.62	13.93	0.96	7.69
n6 PUFA	11.06	9.17	12.42	1.02	9.20
n3 PUFA	0.62	0.57	0.65	0.03	4.90
n6/n3 ratio	17.94	15.81	19.48	1.35	7.53
Sterols (mg.100g^{-1})					
Cholesterol	45.00	30.00	67.00	11.44	25.42

x – mean, min – minimum, max – maximum, s – standard deviation, v% - variation coefficient , SFA: saturated fatty acids, MUFA: monounsaturated fatty acids, PUFA: polyunsaturated fatty acids

Conclusion

In the paper, we have analyzed the chemical composition of meat and intramuscular fat of the breed White Mangalitsa. It has been shown from the results of our experiment as well as from the results of other authors that besides the breed, the chemical composition of meat and intramuscular fat are also significantly influenced by different breeding conditions. Compared to commercial breeds, the breed Mangalitsa is characterized by a more favorable composition of individual groups of fatty acids in intramuscular fat and the n6/n3 PUFA ratio.

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Corresponding Address:
Ing. Ivan Imrich, PhD.
University of Agriculture in Nitra
Faculty of Agrobiology and food resources
Department of Veterinary Sciences
Tr. A. Hlinku 2, 949 76 Nitra, Slovak Republic
E-mail: ivan.imrich@gmail.com

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