THE FATTY ACID COMPOSITION OF DIFFERENT TISSUES OF NATIVE HUNGARIAN PIG - MANGALITSA

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Background

The breed was developed in the 19th century in the Carpathian basin as a typical fat-producing pig. From the beginning of the 19th century until 1950 it was the most popular swine breed in Hungary. The fat bacon and not at least its salami was a demanded commodity in European markets (Radnóczy, 2000). The breed had almost disappeared in the sixties; this was due to its 32-38% lean percentage, which is far from the present consumers' preferences. The breeders association has been assisting the conservation of the breed since 1994. Nowadays there are only three colour variants of breed: the blond, the red, and the swallow belly Mangalitsa.

Objectives

The aim of this research was to establish the fatty acid composition of intramuscular fat in two muscles (Musculus longissimus dorsi, Musculus semimembranosus) and that of the back fat as well as of the bellies. Besides that, our intention was to examine the possibilities of using this breed in production of dry-cured products.

Methods

A group of fattened castrates of blond Mangalitsa (n=10) was slaughtered at a commercial abattoir (Zalahús RT, Zalaegerszeg) in Hungary. All the Mangalitsa were kept under the same conditions and were fed with a wheat/corn//barley-based ration and in the summer they were given green food. At slaughter the average age of the pigs was 12 months. The animals were divided into two groups (I. 91,64±2,41 kg, II. 114,14±7,70 kg P<0.001) according to their slaughter weight. The pig carcass classification was made by FAT-O-MEATER. Muscle samples were taken from left half carcasses, more precisely from the longissimus between the 11th-12th ribs and from the semimembranosus, whereas fat samples were taken from the back fat between the same ribs. Besides these samples, other samples was taken from the bellies in case of the 2nd group. The chemical composition of muscle samples were analysed according to the relevant Hungarian Standards, the fatty acid content of fat was determined by a Chrompack CP 9000 gas-chromatograph. The statistical analysis (LSD-test) was made by SPSS 10.0 program package.

Results and Discussions

The estimated lean meat content of carcasses was in both groups about 38 %, which is typical for Mangalitsa. Comparing the average back fat thickness (I:4,8 cm vs. II.: 7,0 cm) and rib eye area (I.: 4,8 cm vs. II.: 5,4 cm) of the two groups significant differences can be found. The data demonstrated in **Table 1.** shows, that in line with the increased slaughter weight, the crude protein content decreased but the crude fat content increased in both analysed muscle samples. It deserves attention, that the intramuscular fat content of longissimus muscle in case of other native pig breeds such as Turopolje (*Dikic et al 2002*) and Iberian (*Oliver et al. 1997*), was lower (2,5-4 %), than that of Mangalitsa. The amount of intramuscular fat in meat is getting one of the most recent breeding objectives in present-day pig selection, futhermore, it is a well-known fact that the high intramuscular fat content causes very juicy and tasteful meat. The moisture and crude ash content of longissimus was lower, but the crude fat content was higher, than those in semimembranosus. In **Table 2.**, the fatty acid composition of intramuscular fat of muscle samples can be seen. According to the results, there were significant alterations concerning myristic acid (C 14:0) and linolenic acid (C 18:3 n-3) in both muscle samples. The intramuscular fat contains a low polyenoic fatty acid percentage and high oleic acid content compared to commercial breeds (*Barton-Gade, 1987*). The good quality lard is one of the possible products of Mangalitsa on the present-day market. In case of the heavier group, the backfat contained significantly less margaric acid (C 17:0), and arachic acid (C 20:4 n-6), however the linoleic acid (C 18:2 n-6) and eicosadienic acid (C 20:2 n-6) content of fat was significantly higher **(Table 3.)**. As a result of this, the proportion of MUFA and PUFA in the two groups differed significantly. *Honkavara (1989)* suggested that good measure for fat firmness is the ratio of stearic acid (C 18: 0) and the linoleic acid (C 18:2 n-6). This ratio – in our experiment – in case of the back fat was favourable: 1,06. In the 2nd group the back fat of the animals contained more SAFA and less MUFA, than the bellies. Concerning PUFA, there was no significant difference, their ratio both in back fat and bellies were about 15 %, which is a desirable value (*Warnants et al 1996)*.

Conclusions

The high intramuscular fat content of Mangalitsa is suitable for salami production. The slaughter of smaller live weight reduced the fat content of meat and had an effect on protein content of loin and ham, as well as on fatty acid composition. Comparing the fatty acid composition of back fat and bellies can be established, that the back fat contained more saturated and less monounsaturated fatty acids. The back fat is excellently suited for production of high quality bacon fat (firm, long shelf-life). The fatty acid composition and the nutritional value of meat can be improved by special feeding systems (keeping on pasture).

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Table 1. The chemical composition of muscle samples of different live weight slaughtered Mangalitsa pigs

Traits (%)	I. group n=5	II. group n=5	Total n=10	P	I. group n=5	II. group n=5	Total n=10	P
M. longissimus					M semimembranosus			
Dry matter	31,04±2,60	31,20±2,01	31,12±2,19	NS	26,80±0,49	26,06±1,09	26,43±0,89	NS
Moisture	68,96±2,60	68,80±2,01	68,88±2,19	NS	73,20±0,49	73,94±1,09	73,57±0,89	**
Crude protein	22,04±1,05	21,24±0,56	21,64±0,90	NS	22,88±0,23	22,16±0,50	22,52±0,53	NS
Crude fat	7,72±3,66	9,04±2,12	8,38±2,91	NS	2,68±0,59	2,78±1,06	2,73±0,81	NS
Crude ash	1,03±0,06	1,00±0,03	1,02±0,05	NS	1,08±0,05	1,11±0,05	1,09±0,05	NS

Table 2. The fatty acid composition of different muscle samples

Fatty acids (%)	I. group n=5	II. group n=5	P	I. group n=5	II. group n=5	P
	M longissimus			M. semimembranosus		
C 10:0	0,07±0,01	0,10±0,01	**	0,05±0,02	0,06±0,01	NS
C 12:0	0,06±0,01	0,08±0,01	*	0,04±0,01	0,06±0,02	NS
C 14:0	1,26±0,10	1,42±0,05	*	0,95±0,06	1,05±0,08	*
C 14:1	0,02±0,01	0,03±0,00	*	0,02±0,01	0,02±0,01	NS
C 15:0	0,03±0,00	0,02±0,00	***	0,04±0,01	0,03±0,01	NS
C 16:0	23,85±0,80	25,30±0,43	**	21,36±0,46	21,78±0,50	NS
C 16:1	4,03±0,09	4,93±0,60	*	3,54±0,36	4,17±0,85	NS
C 17:0	0,31±0,12	0,26±0,14	NS	0,65±0,19	0,41±0,12	*
C 17:1	0,21±0,03	0,19±0,06	NS	0,26±0,03	0,21±0,03	*
C 18:0	10,16±0,49	10,22±0,63	NS	9,44±0,73	8,91±0,88	NS
C 18:1 cisz-9	51,32±1,72	50,61±1,16	NS	0,46±0,11	0,28±0,04	**
C 18:1 transz-9	0,34±0,08	0,23±0,09	NS	47,85±4,39	48,24±3,11	NS
C 18:2 n-6 cisz	6,52±0,94	5,52±0,86	NS	11,03±2,39	11,49±2,12	NS
C 18:3 n-3	0,31±0,03	0,14±0,03	***	0,37±0,06	0,25±0,08	*
C 20:1 n-6	0,10±0,01	0,11±0,01	NS	0,10±0,01	0,12±0,01	NS
C 20:2 n-6	0,30±0,03	0,27±0,04	NS	0,43±0,06	0,51±0,07	NS
C 20:3 n-6+ C 22 :1 n-9	0,14±0,05	0,14±0,04	NS	0,33±0,08	0,32±0,11	NS
C 20:3 n-3	0,02±0,01	-	NS	0,05±0,01	-	NS
C 20:4 n-6	0,87±0,43	0,45±0,14	NS	2,77±1,21	1,91±0,58	NS
C 22:2 n-6	0,03±0,01	-	NS	0,10±0,04	0,07±0,05	NS
C 20:5 n-3	0,05±0,02	-	NS	0,14±0,04	0,10±0,04	NS
SAFA	35,75±1,29	37,40±1,04	NS	32,55±1,21	32,31±1,29	NS
MUFA	56,02±1,70	56,09±1,15	NS	52,24±4,65	53,04±3,46	NS
PUFA	8,24±1,45	6,51±1,03	NS	15,22±3,72	14,66±2,97	NS

Table 3. The fatty acid composition of back fat and bellies

Fatty acids (%)	Back fat		Total n=10	P	Bellies	P
	I. group n=5	II. group n=5			II. group n=5	
C 10:0	0,05±0,01	0,05±0,01	0,05±0,01	NS	0,07±0,01	*
C 12:0	0,11±0,07	0,10±0,04	0,10±0,06	NS	0,09±0,02	NS
C 14:0	1,39±0,08	1,46±0,16	1,43±0,13	NS	1,45±0,09	NS
C 15:0	0,05±0,00	0,04±0,02	0,05±0,02	NS	0,04±0,01	NS
C 16:0	24,58±0,50	26,33±2,23	25,46±1,78	NS	25,11±2,04	NS
C 16:1	2,26±0,06	2,21±0,38	2,23±0,26	NS	3,12±0,50	***
C 17:0	0,39±0,03	0,29±0,01	0,34±0,06	***	0,30±0,03	NS
C 17:1	0,30±0,04	0,20±0,02	0,25±0,06	**	0,26±0,02	**
C 18:0	12,92±0,43	13,05±0,82	12,98±0,62	NS	9,71±0,65	**
C 18:1 cisz-9	44,87±0,97	40,69±2,38	42,78±2,79	**	44,03±2,54	NS
C 18:1 transz –9	0,60±0,11	0,27±0,02	0,43±0,19	***	0,29±0,04	*
C 18:2 n-6 cisz	11,08±0,31	13,86±0,72	12,47±1,55	***	14,05±0,20	NS
C 18:3 n-3	0,60±0,04	0,50±0,07	0,55±0,08	*	0,52±0,06	NS
C 20:2 n-6	0,54±0,06	0,72±0,09	0,63±0,12	**	0,67±0,07	NS
C 20:3 n-6	0,09±0,01	0,10±0,00	0,10±0,01	NS	0,12±0,02	NS
C 20:4 n-6	0,18±0,02	0,13±0,02	0,16±0,03	**	0,19±0,03	**
SAFA	39,49±0,95	41,33±2,90	40,41±2,25	NS	36,75±2,57	NS
MUFA	48,03±0,94	43,37±2,14	45,70±2,91	**	47,71±2,35	*
PUFA	12,49±0,36	15,31±0,86	13,90±1,61	***	15,54±0,24	NS