INFLUENCE OF EDIBLE FATS CONTAINING LONGCHAIN POLYUNSATURATED FATTY ACIDS IN MUSCULAR LIPIDS FATTENED PIGS

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The addition of fats to the mixture of fattened pigs gives a possibility for positive influence in the content of the adipose and muscular lip (Hartog et al., 1987; Sharma et al., 1987). Enriching the muscular lipids with some long-chain polyens by the food has favourable effect on nutritive value and taste properties of the meat. In this case one should have in mind also the possible alterations in the obtained ani production in its storage.

MATERIAL AND METHODS: Twelve male castrated pigs of the Kambarow breed have been divided in control and trial groups, fatten individually from 30 up to 100 kg live weight. The control animals have been fed with corn-soybean mixture and with addition to the mixt intended for trial pigs of 2% soy oil and 1% fish oil and at the same time reducing the carbohydrate component. The feedstuffs are isoprotei and isocaloric. The pigs have been slaughtered at 100 kg and samples from the m. Longissimus dorsi have been examined immediately period) and other two examples have been kept at -20°C for a month (2nd period) and for 5 months (3rd period), respectively.
Lipids have been extracted from the tissues using the method of Bligh and Dyer (1959) fractioned neutral and polar lipids by TLC. The fa acid composition of intramuscular TG and FFA have been analysed according to Cunnane et al. (1986). Total phospholipids (Bartlett, 1972) a total cholesterol (Sperry and Webb, 1950) have been determined.

RESULTS AND DISCUSSION: The relative amounts of neutral and polar lipids are given in Table 1. The results of the analysis of Longissimus dorsi (m.L.d.) 1st period have shown a tendency towards quantitative increase of TG in the trial animals. It has been found increased level of 18:2 and reduced relative content of 18:1. The changes have been accompanied by a slight increase in the levels of saturat acids. The higher content of TG in the trial animals is favourable for the taste properties of the muscle. This increase corresponds to some exte to the level of added nutritional fat. The absence of more significant changes in the fatty acid composition of the muscular TG emphasizes the role of the enzyme regulatory system (Lee and Kauffman, 1974). This is supported by the absence of change in the level of 18:3 in TG of tri animals, which receive with the food satisfactory quantities of this acid. In the fatty acid composition of the muscles have not been found more long-chain polyens, coming by food. There have not been observed significant changes in control and trial animals in the quantities of TRG from m.L.d. after storage from 1 to 5 months. The storage has a little influence on the fatty acid spectrum of TG from both groups. There has been found a slightly expressed tendency towards decrease in the level of 18:2 and 18:3. The concentration of 18:2 in the trial group is higher than in the control group for the whole period of storage. The results show a comparatively low hydrolyse activity of the muscle TG in the condition for storage.

LIPID COMPOSITION OF MUSCULUS LONGISSIMUS DORSI

Lipid Classes, mg/100g	Control I Period	Control II Period	Control III Period	Trial I Period	Trial II Period	Trial III Period
TG	1368±219	2098±285	1400±225	1783±142	1549±127	1660±133
FFA,nEqv/g	419±91	1515±188*	2033±146*	641±123	1696±95*	2204±107*
Cholesterol	34±1	41±2	45±2*	42±1*	43±2	52±2*
Phospholipids	406±15	516±23*	467±14	401±15	520±13*	478±12*
Fatty Acid Composition of Triacylglicerols, %						
14:0	1.83±0.13	1.12±0.17	1.29±0.15	2.06±0.10	0.95±0.16	0.95±0.19
16:0	28.50±0.67	27.68±0.95	28.90±1.01	30.97±0.54	29.88±0.62	29.56±0.45
16:1	4.85±0.13	4.85±0.25	4.84±0.18	5.32±0.54	4.84±0.22	4.58±0.19
18:0	12.66±0.35	11.48±0.24	11.49±0.59	13.65±0.39	12.25±0.31	12.44±0.19
18:1	47.73±0.98	49.78±1.18	48.48±1.79	43.11±0.87*	46.91±0.80	47.32±0.59
18:2	2.69±0.09	2.86±0.14	2.06±0.09*	3.59±0.29*	2.91±0.23	3.38±0.11*
18:3	1.43±0.09	1.36±0.10	1.29±0.07	1.32±0.08	1.17±0.14	1.27±0.05
20:1	0.20±0.08	0.86±0.10	1.65±0.23	0.20±0.07	1.09±0.16	0.50±0.03
Fatty Acid Composition of Free Fatty Acid, %						
14:0	1.22±0.35	1.47±0.50	0.90±0.10	1.07±0.20	1.31±0.22	0.61±0.15
16:0	32.26±0.79	26.78±1.34*	22.44±1.16*	36.64±1.47	26.21±0.41*	28.00±1.22*
16:1	2.53±0.63	2.85±0.32	2.76±0.22	1.93±0.49	3.60±0.12	2.04±0.10
18:0	20.60±0.64	13.78±0.64*	8.54±0.26*	19.74±2.21	11.59±0.46	11.43±0.59*
18:1	27.29±2.50	25.74±0.66	24.27±1.23	21.92±2.35	23.90±1.04	20.39±0.85
18:2	5.12±1.23	21.04±1.37*	29.63±1.04*	8.76±3.76	27.58±0.50*	32.13±1.25*
18:3	2.10±0.35	1.23±0.08	1.13±0.11	2.06±0.53	1.27±0.07	0.54±0.10
20:1	2.41±0.35	0.98±0.23	1.01±0.10	1.69±0.35	0.85±0.06	0.47±0.10
20:4	6.48±1.20	6.13±0.56	9.32±0.93	4.19±0.86	3.68±0.35	4.42±0.26

The total quantity of FFA in m. Longissimus dorsi in the two groups of animals for the 1st period is relatively low and shows a moderate level of formation and consumption of this metabolite. The tendency of increased level of 18:2 in the trial animals may be connected with the influence of the nutritive factor. After 2nd and 3rd periods of storage an increase in the levels of the 18:2 and reduction in these of 16:0 and 18:0 has been founded. The total quantity of FFA of the control and trial groups increases during storage. The higher unsaturation of the muscle FFA may be due to the muscular phospholipids, envisaging the comparatively low content of 18:2 in their TG.

The content of cholesterol in m.L.d. is low and that may be due to a breed specificity. Of significance may also be the low level of sterols or other components of the food which influence its endogenic synthesis. The low level of muscular cholesterol may be connected to the cholesterol lowering effect of the soy protein (Park et al., 1987) included in the mixtures of the two groups of animals. In the trial group has been established significant increase of cholesterol in comparison to the control group,.

The content of total phospholipids in m. Longissimus dorsi of the two groups is comparatively little influenced by the nutritive factor (Leseigner et al., 1989; Gandemer, 1990), in comparison to its fatty acid composition. After the third period of storage the level of total phospholipids decreases, and here of significance is the increased level of its lipolysis (Dimitrov et al., 1996).

CONCLUSION: The inclusion of unsaturated oils into the food enhanced the muscular TG and also the level of 18:2 in the desired direction and to a certain extent. The storage in appropriate conditions is accompanied by an increase in the quantity of FFA and their total unsaturation improves the flavour of meat. Useful theoretical and practical information of the influence of moderate quantity of unsaturated alimentary fats has been obtained.

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