The Effect of Chosen Food Oils to Supplementation of Last Fattening Pigs Period on Fatty Acids Structure in Pig Muscle Fat and the Consumption Preference

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Abstract
Fatty acids profile in broilers feed, it is possible to influence their share in a desired structure, which can balance the n-6:n-3 ratio in food, according to the consumers needs. Flax seed to lactating goats can be used as nutritional supplement to reduce saturated fatty acids and increase polyunsaturated fatty acids in milk. A significant increase in CLA in milk was achieved by supplementation to goats. In experiment last month of fattening group of pig in five groups of pig was fed with a basal diet, which incorporated various fats (canabis oil-2%, soybean oil-5%, linseed oil-5%, raps oil5%). The indicators (food intake, body weight gain, and the conversion) were established during the experiment, and in the end, the content of essential fatty acids (linoleic and linolenic acids) in pigs meat were determined. The data was analyzed and statistically interpreted. By the four experimental groups, there are some variations of the determined fatty acids content in pectoral muscles as well as in breast skin.

Keywords: pigs, protein and fat structure, food vegetal oils. fatty acids profile, ω-3 enriched foods

1. Introduction

For consumers has many information about meat quality from functional foods for healthy. Near the rich of protein content is the meat low content of fat. Aim of this experiment is the information of fatty acids in monounsaturated MUFA and polyunsaturated form in the body fat of muscle. Many researchers organized experiments with addition chosen food oils and oil seed to supplementation of fatty acids structure in milk of ruminants and meat from chicken, pig and fish.
Flax seed to lactating goats can be used as nutritional supplement to reduce saturated fatty acids and increase polyunsaturated fatty acids in milk. A significant increase in CLA in milk was achieved by supplementation to goats [1].
In two experiments at three experimental groups (each n=9 cows) the supplement of protein through extracted soya and AMINOTEK were observed. The contents of milk nutriments were decreased at the control group and at the both experiment groups in January. A tendency to higher level of proteins, methionin and cystin was at the experiment groups. The content of lysine is constant. The oil acid could be basic component in another non-saturated acid in milk fat (NNKT) [2].
The content of polyunsaturated fatty acids (PUFA) in poultry meat depends on their content in the diet to great extent. Enrichment of poultry products within 3 PUFA may provide an excellent alternative source of these acids in the human diet [3]. Fatty acids profile in broilers feed, it is possible to influence their share in a desired

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structure, which can balance the n-6:n-3 ratio in food, according to the consumers needs. [4]. Unsaturated lipids readily undergo oxidation to produce peroxides and aldehydes. The oxidative stability of unsaturated lipids decreases as their degree of instauration increases. Poultry meat with enhanced linolenic acid content is more susceptible to oxidative damage than meat with similar concentration of linoleic acid. The balance of volatile compounds resulting from an oxidative breakdown of n-3 PUFA causes the occurrence of fishy aroma and off taste characteristic of the meat of poultry fed a higher level of n-3 PUFA [5].
The aims of this study was to investigate the effect of chosen addition of chosen food oils at last fattening pigs period that the all fattening time is too expensive.

2. Materials and methods

Thirty crossbreed fattening pig**s** (Czech Large White x Czech Landrace) x (Czech Landrace x Pietrain x Hampshire) in period CDP- concentrate feed with addition of food oils was in control station mixed individual for each experimental group separate. In experiment last month of fattening group of pig in five groups of pig was fed with a basal diet, which incorporated various fats-instead barley (canabis oil-2%, soybean oil-5%, linseed oil-5%, raps oil 5%). The indicators (food intake, body weight gain, and the conversion) were established during the experiment, and in the end, the content of essential fatty acids (linoleic and linolenic acids) in pigs meat were determined. The data was, analyzed and statistically interpreted. Feed, meat analyze by the standard method AOAC 2003 (structure of mixture was wheat, barley, soya bean diet and premix), Amino acids on the equipment and methods AAA 400, fatty acids of methyl esters by Colognado Monzese Italy on department of chemistry were analyzed. By the four experimental groups, there are, some variations of the determined fatty acids content in pectoral muscles (musculus longissimus lumborum et thoracis - MLLT) as well as in breast. The animals are weight each 14 days, registered feed concentrate for groups. Water consumption was ad libitum. The experiment was end in average weight 105-+ kg. Animals were slaughtered in special slaughter house, and after 24 hours post mortem the individual samples of meat from each pig were collected in PE bags and frozen. Statistic ANOVA method for the evaluation were used.
Cannabis pressing content 2% of cannabis oil

- Fattener – 90kg
- Digest. Lys/MJ ME – 0,5g
- X – wheat + barley
- Y – soybean meal
  X + Y = 97%
- Mineral supplements – 3%
  Count of digestible lysine of each grain components
  x + y = 0,97
  0,23x + 1,78y = 0,5
  x = 0,97 – y
  0,23(0,97 – y) + 1,78y = 0,5
  0,2231 – 0,23y + 1,78y = 0,5
  1,55y = 0,2769
  y = 0,17 – soybean meal
  x = 0,8 – wheat + barley

3. Results and discussion

40 % of total meat consumption is in Czech Republic the pig meat. In this meat is to much saturated fatty acid there have negative effect on human healthy. There are two ways to solve this negative situation. First one is crossbreed with the meat pigs as Landrace, Pietreain, and Hampshire. Second opportunity is feed the food oil and oil seed, but it is necessary the daily dose observed and also the influence of meat structure. In last experiment the whole supplementation of food oils and oil seeds were observed. The content of SFA was in experimental groups reduced and the PUFA and MUFA are increased. But the experiment was too expensive. In this experiment we the last fattening period with the same orientation we were organized. The content of crude protein in experimental group were 155g/ kg, Fat 5.2 g, 13.12 MJ MP/kg In control group 152g/kg, 2.1 g/kg , 12.7 MJ MP respective/kg. There was no statistic significant.

Table 1. Composition of the doses for fattener

Composition of the doses for fattener						
Group	C	I	II	III	IV	V
Components (%):						
Wheat	40	35	35	35	35	40
Barley	40	40	40	40	40	40
Soybean meal	17	17	17	17	17	12
Min. supplements	3	3	3	3	3	3
Cannabis press.	-	-	-	-	-	5
Linseed oil	-	5	-	4,5	4	-
CLA	-	-	-	0,5	1	-
Rape oil	-	-	5	-	-	-
Nutrient content:						
ME (MJ/kg)	12.7	13.7	13.2	13.7	13.7	12.5
NL (g/kg)	168	162.2	162.2	162.2	162.2	160
Digest. Lys (g/kg)	6.4	6.4	6.4	6.4	6.4	6.4

Table 2. Content of fatty acids in fat muscle MLLT

Text	Control	Cannabis oil	Soya bean oil	Linseed oil	Raps oil	Contr: exp.gr. aver.SD	Between exp.groups.SD
SFA	43.85	41.25	41.85	41.42	41.12	*	ns
MUFA	35.26	34.63	41.39	34.63	36.43	*	*
PUFA	15.52	18.10	20.85	23.39	23.97	***	*
MUFA/ PUFA	2.27	1.913	1.985	1.481	1.520	*	*
MUFA/ SFA	0.804	0.840	0.989	0.836	0.886	*	*
PUFA/S FA	0.354	0.434	0.498	0.565	0.583	*	*
AI	0.73	0.66	0.66	0.66	0.66	ns	ns
ThI	0.80	0.85	1.00	1.28	1.30	*	*
ω 3FA	-	56.0	48.4	49.52	54.20		*
ω 6 FA	-	21.0	5.5	15.46	13.90		***

SFA- saturated fatty acids, MUFA- monounsaturated fatty acids, PUFA- polyunsaturated fatty acids, AI- Atherogenic index=(C12+4.C14+C16)/(MUFA+PUFA) (Chilliard et al 2003), ThI- thrombogenic index=(C14+C16+C18)/(0,5.MUFA+0,5.n6PUFA+3.n-3PUFA+n3/n6PUFA) (Ulbrichtand Southgate 1991), SD-Standard deviation, MLLT –musculus longissimaus lumborum et thoracis. *ω6 FA- (C 18:2n6c + C 18:2n6t), * ω3FA- (α-linolen acid C 18:3n3). *-content in nature oils.

Table 3. Fattening performance and carcass characteristics

	C	1	2	3	4	5
Average initial body weight (kg)	65.77±5.504	64.66±4.659	64.92±3.112	64.89±3.725	64.90±3.819	64.88±3.921
Average final body weight (kg)	111.19±6.711	113.79±6.671	116.38±5.136	114.45±5.984	115.51±5.7423	111.53±5.896
Average daily weight gain (g)	1107±179.9	1067±205.4	1009±178.1	1076±189.5	1045±162.0	1012±192.5
Average daily feed intake (kg)	3.79±0.302	3.79±0.296	3.86±0.350	3.89±0.295	3.92±0.300	3.98±0.342
Feed/gain ratio (kg/kg)	3.42±0.645	3.54±0.579	3.82±0.720	3.48±0.552	3.42±0.563	3.80±0.611
Average dressing percentage (%)	80.64±3.358	80.13±2.882	79.57±3.418	79.21±3.292	80.07±3.315	79.35±3.411
Average back fat thickness of 5 measurements (mm)						
Average loin "eye" area (cm^2)	29.66^{a}±4.469	26.40^{b}±4.212	27.42±3.112	28.63^{b}±4.454	28.13^{b}±4.198	2677±3.997
Average carcass meatiness (%)	43.30±4.331	44.40±5.131	46.46±7.515	45.22±5.654	45.84^{b}±6.214	46.23±5.896
pH_{45}	49.17±5.288 6.39±0.173	51.06±3.453 6.35±0.147	49.57±5.210 6.31±0.140	49.59±4.897 6.36±0.141	49.60±4.981 6.33±0.144	49.44±4.988 6.36±0.143

Table 4. Proteinogram of weaner's blood serum

Group	Leukocytes	Albumins		α -globulins		β-globulins		γ –globulins		IgG	Hp
	g/L	%	g/L	%	g/L	%	g/L	%	g/L	g/L	g/L
I	52.28	41.35	21.60	23.10	11.93	15.36	8.00	20.07	10.62	10.53	1.94
II	53.75	51.72	27.82	21.19	11.35	15.46	8.33	11.62	6.22	8.71	3.45
III	52.70	46.04	24.42	23.01	12.02	17.25	9.05	13.70	5.57	9.64	3.95
IV	52.43	46.35	24.29	23.65	12.39	16.86	8.87	13.13	6.91	8.26	2.59
V	52.55	46.41	24.52	23.22	11.94	16.92	8.98	13.15	6.55	8.53	2.33

4. Conclusions

After adding the various components to the dose, content of the energy in each experiment was changed. The increase of energy was in the experiment I, II, III and IV, while in experiment II, after the addition of cannabis, there was a slight decrease of energy.

Where was reduction of wheat in a dose, content of protein in each experiment was lower than in the control group. The lowest content occurred in experiment V, after adding the cannabis.

Content of digestible lysine in each experiment was the same as in the control group. It was found that the increase in crude fibre content of complete diets for experimental pigs had no significant effect on pig performance and carcass characteristics.

The effect of supplementation of food oils in last period of fattening pigs has positive effect on fatty acid profile in muscle MLLT fat structure. Resource of unsaturated fatty acids MUFA, PUFA has protective effect for human health of heart. The acids content in different sort of chosen oils are significant in difference as ω6 FA. In the results of proteinogram spetialle of γ –globulins and IgG statistically increased by group 1. The differences between other groups are without statistic sense.

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