The effect of feeding fatteners with a preparation from flax seeds on meat lipid fatty acid profile

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Introduction

The application of seeds of oil plants or oils in the feeding of fatteners has a significant advantageous effect on the composition of fatty acids in reserve fat and meat lipids (Lauridsen *et al*., 2005; Mitchaothai *et al*. 2007). Enrichment of the muscle tissue lipids with polyunsaturated fatty acids (PUFA), especially those belonging to the n-3 family, improves the dietary value of pork. Moreover, these acids have to be supplied in food as they serve many biologically essential functions in the organism (Barowicz and Kędzior, 2000).

The aim of the study was to produce pork with improved dietary value by feeding pigs in the finishing stage of fattening with concentrates containing an addition of a preparation LeenLife E containing linseed oil.

Materials and methods

A total of 45 analyzed fatteners of identical pedigree – four-breed hybrids (Polish Large White) x (Polish Landrace) x (Hampshire x Duroc) were fed in the finishing stage of fattening (30 and 60 days) with a concentrate containing a 5% (group A) and 7.5% addition (group B) of linseed oil preparation. This preparation with a trade name LeenLife E is a Polish invention, which basic ingredients are salts of fatty acids found in linseed oil (patent pending). The control group (C) was fed a concentrate. Fattening was performed in the same piggery. Animals were slaughtered in the summer season immediately after they were delivered to the abattoir. After slaughter their carcass weight was determined and carcass meatiness was evaluated using an Ultra-Fom 300 ultrasound device, while backfat thickness was measured in 5 carcass points using a ruler. Samples of backfat from the dorsal part of the carcass and samples of the longissimus dorsi (LD) muscle were collected after carcass cooling. The fatty acid composition was determined by gas chromatography according to Polish Standards PN-ISO5509 and PN-ISO5508.

Results were subjected to statistical analysis, using the two-way analysis of variance. The significance of differences was determined using the Tukey test. For the control means were given for data after 30 and 60 days of feeding.

Results

The level of meatiness in analyzed groups was similar both in the control and in experimental groups. amounting to approx. 57%. In groups A and B after 60-day feeding in relation to the 30-days period a significantly higher carcass weight was recorded, i.e. 97 and 103 kg in comparison to 80 and 79 kg. Mean backfat thickness in 5 points on the carcass was similar in groups A and B after 60 days of feeding, amounting to 25 mm. Intramuscular fat content at both doses was recorded after 60 days at 2.5%, while after 30 days it was by 0.5% less. Fatty acid contents in backfat are presented in Table 1.

Discussion

Results indicate that the introduction of mixes of both doses of the preparations 60 days before slaughter resulted in a reduction of subcutaneous fat, but it did not affect changes in meat content in the carcass. It is an interesting observations as these carcasses were characterized by an approx. 20 kg more weight in relation to pigs fed the preparation for 30 days.

In lipids of the LD muscle in the analyzed groups no significant differences were observed in the total contents of saturated fatty acids (SFA) and unsaturated fatty acids (UFA). The ratio of polyunsaturated fatty acids PUFA n-6 to n-3 was low and amounted 2,8. Other authors abstained this ratio some times higher (Grela 2000; Barowicz and Kędzior 2000).

In the fatty acid composition in backfat significant differences were shown between the experimental groups and the control. This advantageous effect of the incorporation of the preparation in the feeding regime was observed in the lipid composition of the experimental groups, especially in the considerable share (over

20%) of polyunsaturated fatty acids PUFA. In comparison to the analyses conducted by other authors it was over two times higher. In backfat of fatteners fed an addition of amaranth the PUFA content was only approx. 10% (Bobel and Sokół, 2000). In experimental groups A and B after 60 days in comparison to the control more PUFA acids were recorded (by 6.9 and 8.14%, respectively). The statistically significant increase in PUFA n-3 content was found to be from 2.57% in the control to 5.07 – 8.92% in the experimental groups. Moreover, a change was observed in the proportion of PUFA n-6 to n-3 from 5.56 in group C to approx. 1.7- 2,5 in the other groups. In earlier studies in backfat of fatteners of a similar breed, fed APC premixed feed this ratio was 11 (Wajda *et al*., 2004).

Conclusions

Conducted preliminary studies showed that the application of an addition of both doses of LeenLife E to concentrates in pig feeding, especially 60 days before slaughter, had a significant effect on the reduction of subcutaneous fat while maintaining high weight and meatiness in the carcass (approx. 57%). In backfat lipids the PUFA content increased considerably. In experimental groups A and B the ratio of PUFA n-6 to n-3 was three times lower than in the control.

In fat of the LD muscle the ratio of these acids was similar (approx. 2.8) in all experimental groups. This result meets the requirements of the World Health Organization, recommending for the ratio of the above mentioned acids not to exceed 4.

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Table 1. Content of fatty acids in backfat of investigated groups of fatteners

Specification	Groups					SEM	Significant differences	
	C	A (5%)[x]		B (7,5%)[x]				
	Two periods	30 days	60 days	30 days	60 days			
	mean	mean	mean	mean	mean		days	dose
C14:0	1.17^{AB}	1.27^{A}	1.30^{A}	1.18^{AB}	1.09^{B}	0.14	**	NS
C16:0	22.41^{a}	22.42^{a}	19.93^{b}	21.87^{a}	20.29^{b}	1.52	*	NS
C16:1	2.78^{A}	2.73^{A}	2.64^{A}	2.15^{B}	2.18^{B}	0.34	**	**
C18:0	9.59	9.15	9.13	9.55	10.10	1.39	NS	NS
C18:1	46.66^{C}	44.64^{A}	43.77^{A}	41.15^{B}	40.91^{B}	2.85	**	**
C18:2 n-6	12.21	11.71	12.59	13.04	13.50	1.53	NS	NS
C18:3 n-3	2.57^{A}	5.07^{B}	7.94^{BC}	8.34^{C}	8.92^{C}	1.60	**	**
C20:0	0.15	0.18	0.15	0.14	0.17	0.04	NS	NS
C20:1	0.82	0.89	0.76	0.68	0.74	0.17	NS	NS
C20:2 n-6	0.39	0.37	0.34	0.35	0.36	0.10	NS	NS
C20:3 n-6	0.17	0.18	0.12	0.18	0.18	0.05	NS	NS
C20:4 n-6	0.21^{A}	0.48^{B}	0.53^{B}	0.56^{B}	0.73^{C}	0.17	**	**
SFA	33.32^{A}	33.02^{A}	30.51^{B}	32.74^{A}	31.65^{B}	0.77	**	NS
UFA	65.82^{A}	66.07^{A}	68.69^{B}	66.45^{Aa}	67.52^{Bb}	0.93	**	NS
MUFA	50.26^{A}	48.26^{B}	47.17^{B}	43.98^{C}	43.26^{C}	1.12	**	**
PUFA	15.55^{A}	17.81^{B}	21.52^{Ca}	22.47^{C}	23.69^{Cb}	0.97	**	**
PUFA n-3	2.57^{A}	5.07^{B}	7.94^{BC}	8.34^{C}	8.92^{C}	1.60	**	**
PUFA n-6	12.98^{A}	12.74^{AB}	13.58^{B}	14.13^{C}	14.77^{C}	0.48	**	**
DFA	75.41^{A}	75.22^{A}	77.82^{BC}	76.00^{B}	77.62^{B}	1.16	**	NS
OFA	23.58	23.69	21.23	23.05	21.38	0.82	NS	NS
UFA/SFA	1.97	2.00	2.25	2.03	2.13	0.85	NS	NS
PUFAn-6/PUFAn-3	5.56^{A}	2.51^{B}	1.71^{C}	1.69^{C}	1.62^{C}	0.67	**	**

N A.B.C**- differences significant at P ≤0.01
a.b* - differences significant at P ≤0.05
NS - statistically not significant
x - dose of preparation
SEM - standard error meat