THE EFFECT OF FEEDING THE FATTENERS WITH THE FEED, CONTAINING A HIGH CONTENT OF MAIZE ON THE FATTY ACID PROFILE IN A SMOKED LOIN

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I. INTRODUCTION

In Poland, production of maize grain is increasing [3]. The maize may be a component of concentrates for nutrition of monogastric animals. This raw material is a valuable feed that can be used in virtually any pig production group [4].The maize grain contains a lot of easily digestible carbohydrates and relatively high fat content what affects its high energetic value [1,2]. At present, the addition of maize to concentrates employed in pig production in Poland is found on the level of up to 30%.

Maize fat contains a relatively high level of unsaturated fatty acids [5]. The application of high rates of maize grain in nutrition of fatteners may have an influence on fatty acid profile of meat and its products and consequently, affect their nutritional value.

The aim of the studies was to determine the effect of feeding the fatteners with the concentrates, containing a high participation (60%) of the maize grains on the fatty acid profile of smoked loin.

II. MATERIALS AND METHODS

The studies were performed on two groups of Polish White Landrace pigs; the first group was fed the concentrate mixture with the content of 60% maize (n=24) (variant A) and the other group received the feed without the addition of the maize grains (n=25) (control variant C). The experiment was carried out in the SKURTCH (Pig Slaughter Performance Testing) Station in Chorzelów (Poland), with the application of the procedures of nutrition and feeding, as adopted by the National Institute of Animal Production. The animals were slaughtered at the body weight of ca. 100 kg, using electric stunning, de-bleeding in horizontal position and chilling down by a single stage method. The cutting of half- carcasses was conducted after 48h since slaughter. The pork loins were subjected to the brine injection in the quantity of 10% (the composition of the brine: curing mixture – 19.1% (NaCl- 99.6%, $NaNO_2$ – 0.4%), sodium citrate – 2.1%, glucose – 2.0%, sodium ascorbate - 0.4%, water – 76.4%) and then, to the process of massaging (6h) and ageing (9h). After this, the loins were smoked in a smoke at the temperature of 60-65^{o}C. In the final product, the following determinations were carried out: the fatty acid profile (PN-EN ISO 12966-1:2015-01), fat content (PN-ISO 1444:2000), water content (PN-ISO 1442:2000) and protein content (PN-75/A-04018/Az3:2002). The results of the tests were statistically analysed. The significance of differences between the values was determined on the ground of a single-factor variance analysis at the significance level $p \leq 0.05$. The calculations were performed using programme Statistica 6.0.

III. RESULTS AND DISCUSSION

The basic chemical composition of the tested loins did not reveal any significant differences ($p \leq 0.05$) between the studied variants. Fat content in the examined samples was found on the similar level and amounted to ca. 3.0%. The conducted studies showed a significant effect of feeding the fatteners with the maize ($p \leq 0.05$) on the percentage content of PUFA and the discussed loins were characterized by a lower level of α-linolenic acid (C18:3 n-3) (by 0.07%) as compared to the control loins. On the other hand, the significant differences between the samples were revealed in respect of C20:2 n-6 content, the level of which in variant with maize was by 0.13% higher in comparison to the control sample. At the same time, the higher by 3% content of linoleic acid (C18:2 n-6) was found in

the loin of the pigs fed the maize as compared to the control loin. In the tested loins, the summary content of saturated acids was found on the similar level (Tab.1). The application of the maize in the diet of the pigs affects the ratio of fatty acids; it is especially visible in the case of linoleic acid. Casa et al. (2010) conducted the studies on the Italian Duroc x Large White pigs and employed the maize with the differentiated level of linoleic acid (C18:2) in their nutrition. The authors found higher level of PUFA acids (16.05%) in the subcutaneous fat of the pigs fed the diet with average level (0.3%) of linoleic acid as compared to the diet with a low level (0.15%) of the discussed PUFA acid (13.95%).

Table 1 Total fatty acid composition of smoked loin (%; mean ± standard error)

Fatty acid	Sample			Fatty acid			
n=9	C	A	Significant	n=9	C	A	Significant
10:0	0,08±0,01	0,08±0,01	ns	20:1	0,88±0,16	0,90±0,1	ns
12:0	0,09±0,02	0,11±0,03	ns	20:2	0,38±0,11^{y}	0,51±0,07^{x}	
14:0	1,15±0,06	1,12±0,08	ns	20:3 n6	0,18±0,05	0,22±0,04	ns
15:0	0,06±0,01	0,03±0,03	ns	20:4	1,07±0,41	1,39±0,37	ns
16:0	24,16±1,05	23,20±1,05	ns	20:3 n3	0,10±0,02^{y}	0,08±0,01^{x}	
16:1	2,58±0,38	2,44±0,24	ns	20:5	0,05±0,01	0,01±0,02	ns
17:0	0,25±0,06	0,28±0,06	ns	22:4	0,24±0,10	0,32±0,08	ns
17:1	0,22±0,05	0,22±0,05	ns	22:5	0,18±0,04	0,17±0,04	ns
18:0	14,65±1,70	13,52±1,26	ns	cholesterol	47,68±2,71	45,94±3,15	ns
18:1trans	0,15±0,01	0,18±0,07	ns	SFA	40,64±2,42	38,56±2,15	ns
18:1cis9	40,02±1,42^{y}	38,56±1,02^{x}		MUFA	47,15±1,74^{y}	45,46±1,04^{x}	
18:1cis11	3,08±0,35	2,93±0,26	ns	PUFA	12,08±2,93^{y}	15,77±1,76^{x}	
18:1 c inne	0,21±0,02	0,22±0,03	ns	n6	11,04±2,84^{y}	14,81±1,65^{x}	
18:2	9,23±2,27^{y}	12,45±1,23^{x}		n3	0,33±0,07	0,31±0,07	ns
18:3 g	0,12±0,02	0,13±0,03	ns	n6/n3	33,70±7,19^{y}	49,09±8,34^{x}	
18:3	0,55±0,05^{y}	0,48±0,04^{x}		n3/n6	0,03±0,01^{y}	0,02±0,00^{x}	
20:0	0,24±0,06	0,22±0,03	ns				

A – smoked loin produced with pigs fed with maize; C - the control sample. Mean values by different letters statistically significantly ($p \leq 0,05$) SFA: sum of all saturated fatty acids; MUFA: sum of all monounsaturated acids; PUFA: sum of all polyunsaturated fatty acids; xy – Different letters within a row indicate significant differences $P \leq 0.05$; ns – not significant.

IV. CONCLUSION

The conducted studies confirm the effect of feeding the pigs with the maize on the quantity of the polyunsaturated fatty acids in meat what – from a viewpoint of nutrition – is a positive tendency. The nutritive quality of meat and its products is also determined by the ratio of PUFA n-6/n-3. In the loins, obtained from the pigs fed the maize, the higher ratio of n-6/n-3 was recorded as compared to the control sample, what is not a positive tendency. The high level of polyunsaturated fatty acids may have an influence on the oxidative changes during the storage of the products.

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