



Effect of breed and rearing system on intramuscular fatty acid profile of *M. Semimembranosus* in raw Slavonian ham

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ABSTRACT - The effects of breed and rearing system on fatty acid (FA) profile of *M. Semimembranosus* in raw Slavonian ham were evaluated. Forty pigs were grouped by breed (Black Slavonian (BS) vs. Black Slavonian x Duroc (BSxD)) and by rearing system (outdoor vs. indoor), 10 pigs per group. All of the saturated FA (SFA) and monounsaturated FA (MUFA) significantly affected by genotype showed smaller values in the intramuscular fat of BS than of BSxD pigs. The percentage of polyunsaturated FA (PUFA) was higher in BS pigs than BSxD pigs. The PUFA/SFA and n-6/n-3 ratios were more favourable in BS pigs. Within SFA and MUFA, only C16:1 and C18:0 were affected by rearing system. On the other hand, rearing system influenced most of the PUFA, but without clear effect on PUFA/SFA and n-6/n-3 ratios.

Key words: Pigs, Fatty acid profile, Breed, Rearing system.

Introduction - Black Slavonian (BS) pig is an autochthonous Croatian breed kept in the past in the outdoors and fed on pastures and oak woodlands (Karolyi *et al.*, 2008). At the end of the 20th century breed was critically endangered, but after the recent state protection the population of BS pigs increased. In the last few years there have been around 600 sows. Today's, pigs are kept in different ways, from fully outdoor to completely intensive system. Due to lower growth rates, the BS breed has been also crossed with modern breeds (Luković *et al.*, 2007). The BS pigs and their crossbreeds are used for production of local meat products, such as Slavonian ham and kulen. Fatty acid (FA) profile of muscle tissues, as one of the most important attribute of meat quality, is influenced by many effects, such as genotype (Nürnberg *et al.*, 1998; Wood *et al.*, 2008) and rearing system (Hansen *et al.*, 2006). The aim of the paper was to analyze the effects of breed and rearing system on FA profile of intramuscular fat from *M. Semimembranosus* in raw Slavonian ham.

Material and methods - Forty BS and BS x Duroc (BSxD) pigs were fattened under two different rearing systems: indoor and outdoor. There were 10 pigs per breed x rearing system

group, balanced by sex. In the indoor system pigs were fed with conventional diets; from 30 to 100kg (13MJ ME/kg, 16% of crude protein), and from 100 to 135kg (13 MJ ME/kg, 14% of crude protein). Outdoor pigs were fed on wood pasture and alfalfa with addition of approx. 1kg corn per animal/d. Indoor pigs were housed in group of the 10pigs/pen, on straw bedded concrete floor. Outdoor pigs were fattened from March to November 2006 in an area of approx. 20ha. All pigs were transported and slaughtered using standard procedure (electrically stunned, 1.5A, 220V). One day after slaughter, samples of *M. Semimembranosus* (approx. 150g) were taken from raw hams, and stored frozen until the analysis. Fatty acid profile of intramuscular fat was determined by gas chromatography using Chrompack CP 9000 (Csapo *et al.*, 1986). The percentage of FA was expressed as a percentage of total FA methyl esters. The results were obtained with two-way analysis of variance by the ANOVA procedure (SAS, 2004) using a model including the fixed effects of genotype, rearing system and their interaction.

Results and conclusions - Breed influenced the FA composition of the intramuscular fat in *M. Semimembranosus* (Table 1).

Table 1. Effect of the breed (B) and rearing system (R) on fatty acid composition of intramuscular fat (*M. Semimembranosus*) in raw Slavonian ham (mean \pm SD).

Fatty acid	Outdoor		Indoor		P value		
	BS	BSxD	BS	BSxD	B	R	BxR
C12:0	0.06 \pm 0.01	0.08 \pm 0.01	0.06 \pm 0.01	0.07 \pm 0.01	**	ns	0.15
C14:0	1.22 \pm 0.10	1.54 \pm 0.19	1.27 \pm 0.09	1.41 \pm 0.13	**	ns	0.13
C15:0	0.04 \pm 0.01	0.04 \pm 0.01	0.04 \pm 0.01	0.05 \pm 0.03	ns	ns	0.39
C16:0	23.41 \pm 0.82	26.33 \pm 1.16	23.88 \pm 0.39	24.98 \pm 1.14	***	ns	0.04
C16:1	2.73 \pm 0.46	3.51 \pm 0.54	1.92 \pm 0.27	2.31 \pm 0.26	**	***	0.28
C17:0	0.37 \pm 0.12	0.33 \pm 0.08	0.36 \pm 0.04	0.45 \pm 0.19	ns	ns	0.24
C17:1	0.30 \pm 0.08	0.31 \pm 0.08	0.30 \pm 0.04	0.40 \pm 0.17	ns	ns	0.31
C18:0	12.19 \pm 0.97	13.21 \pm 0.32	13.68 \pm 1.17	13.31 \pm 0.57	ns	*	0.08
C18:1	48.01 \pm 0.75	46.55 \pm 1.72	46.55 \pm 1.19	46.6 \pm 2.78	ns	ns	0.34
C18:2n-6	8.29 \pm 1.33	5.51 \pm 0.37	9.17 \pm 1.02	7.84 \pm 1.80	**	*	0.21
C18:3n-3	0.49 \pm 0.21	0.17 \pm 0.02	0.38 \pm 0.03	0.27 \pm 0.06	***	ns	0.05
CLA	0.14 \pm 0.02	0.09 \pm 0.02	0.17 \pm 0.05	0.22 \pm 0.13	ns	*	0.11
C20:1	1.03 \pm 0.12	0.83 \pm 0.15	1.09 \pm 0.13	1.05 \pm 0.27	ns	ns	0.30
C20:2	0.41 \pm 0.09	0.22 \pm 0.02	0.53 \pm 0.05	0.44 \pm 0.06	***	***	0.09
C20:3n-6	0.15 \pm 0.03	0.13 \pm 0.02	0.08 \pm 0.01	0.07 \pm 0.01	ns	***	0.31
C20:4n-6	0.43 \pm 0.06	0.46 \pm 0.15	0.17 \pm 0.03	0.16 \pm 0.05	ns	***	0.59
C22:5n-3	0.07 \pm 0.03	0.04 \pm 0.01	0.03 \pm 0.02	0.02 \pm 0.02	*	**	0.37
C23:0	0.10 \pm 0.03	0.03 \pm 0.01	0.09 \pm 0.01	0.06 \pm 0.02	***	ns	0.07
SFA	37.47 \pm 1.18	41.67 \pm 1.38	39.44 \pm 1.00	40.41 \pm 1.73	***	ns	0.01
MUFA	52.09 \pm 0.97	51.21 \pm 1.27	49.88 \pm 1.38	50.40 \pm 2.74	ns	ns	0.37
PUFA	9.86 \pm 1.63	6.55 \pm 0.54	10.37 \pm 1.14	8.81 \pm 1.93	**	*	0.18
PUFA/SFA	0.26 \pm 0.05	0.15 \pm 0.02	0.26 \pm 0.03	0.21 \pm 0.05	***	ns	0.09
n-6/n-3	16.77 \pm 3.67	28.26 \pm 2.82	22.81 \pm 1.46	27.83 \pm 4.59	***	ns	0.05

* $P < 0.05$; ** $P < 0.01$, *** $P < 0.001$, ns=not significant, BS=Black Slavonian, D=Duroc.

All of the saturated FA (SFA) and monounsaturated FA (MUFA) affected by breed (C12:0, C14:0, C16:0, and C16:1) showed smaller values in the intramuscular fat of BS than of BSxD pigs. Intramuscular fat of BS pigs had a higher percentage of polyunsaturated FA (PUFA) than those of BSxD pigs. Furthermore, PUFA/SFA and n-6/n-3 ratios were more favourable for BS pigs. In the group of SFA and MUFA, only C16:1 and C18:0 were affected by rearing system. On the other hand, rearing system influenced most of the PUFA, but without clear effect on PUFA/SFA and n-6/n-3 ratios. The results obtained indicate higher importance of breed than rearing system effect, especially regarding to total PUFA amount and n-6/n-3 ratio.

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