FATTY ACID COMPOSITION AND MEAT QUALITY TRAITS BETWEEN ORGANICALLY AND CONVENTIONALLY REARED KOREAN BLACK PIGS

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Key Words: Conventional pigs, organic pigs and Fatty acid composition

Introduction

Economic pressure on pig industry has resulted in intensive production system in order to decrease production costs. In recent years, animal health, welfare and environment-friendly production have been more and more attracted public concern. Furthermore, the production of lean meat to meet consumers' demands for low-fat pork has resulted in a substantial decrease of intramuscular fat levels and an increased concern that eating quality may be consequently reduced (Cisneros et al., 1996). To face these new challenges, alternative production methods, such as organic livestock farming have been developed. Organic farming puts more emphasis on the production system to meet the demands of a specific consumer segment (Sundrum, 1998). According to the basic standards of IFOAM (1996), organic livestock farming is primarily based on home-grown feedstuffs with the objective of establishing an almost complete on-farm nutrient cycle. The fatty acid composition of the porcine intramuscular fat (IMF) has been shown to be affected by feed composition as reviewed by Bosi (1999). Previous studies have shown that conventional pork is often more tender than pork from organic pork production systems due to lower daily gain in organic production (Danielsen et al., 2000). Moreover, the amount of intramuscular fat in organic pork has been reported to be higher, and the fatty acid composition to be more unsaturated compared with meat from traditionally reared pigs (Hansen et al., 2001). This may result in inferior technological meat quality due to enhanced lipid oxidation and presence of soft fat (Nilzen et al., 2001). Consequently, introduction of organic pig production systems calls for establishment of quality assurance programs that ensure production of high quality pork, as demanded by the organic consumer segment. The objective of the present study was to investigate the effects of organic and conventional feed, on fatty acid composition and meat quality traits in muscle of Korean black pigs.

Materials and Methods

Sixty barrows (Korean Black Pigs) were divided into two groups and fed two different diets, one conventional (30 animal) and the other organic bred pigs (30 animal). As shown in Table 1, organic pigs were raised restrictedly for 11 months in accordance with the Korean Organic Standard, while conventional pigs were fed for 8 months in a conventional manner. The pigs were slaughtered at a commercial abattoir and sampled from a market-weighted industrial population (carcass weight: 90.00±2.7 kg). Samples of the M. *longissimus dorsi* (LD) were used for fatty acid composition and meat quality traits.

Fatty acids were extracted according to Folch et al. (1957), methylated and analyzed by GC as described by Neurnberg et al., (2002). Other quality analyses including cooking loss, shear force, water holding capacity and texture parameters were also carried out. The Statistical Analysis System (1998) was used to determine means, standard errors and analysis of variance. T- test was used to compare differences between conventional and organic pigs. An alpha level $P < 0.05$ was used to determine significance.

Results and Discussion

Overall, fatty acid composition of samples was affected by differences between conventional and organic feed. As shown in Table 2, the organic one had a higher content of unsaturated FA, PUFA, PUFA n-3, PUFA n-6 and PUFA/SFA ratio compared with conventional one ($P<0.05$).

The organic feeding in Korean black pigs had significantly ($P<0.05$) higher water holding capacity and gumminess, significantly ($P<0.05$) lower in shear force value, Springiness, Cohesiveness and Chewiness than conventional one (Table 3).

Conclusions

There were important changes in contents of fatty acids between conventional and organic Korean black pigs in this experiment. Especially, there were higher levels of PUFA n-3, n-6 and PUFA/SFA in organic one than conventional one. This difference of fatty acid composition of samples means that it was influenced by diets between conventional and organic one. The fatty acid profile in the organic feed could be further optimized to give a composition, which will fulfill human nutritional requirements with regard to PUFA n-3 contents.

Table 1. Ingredient composition (%) of the experimental diets for Korean Black Pigs

Ingredient	Conventional diet	Organic diet
Crude protein (%)	17	17
Crude fat (%)	4	2.5
Calcium (%)	0.45	0.5
P (%)	0.4	0.5
Ash (%)	8	10
Crude fiber (%)	6	8
L-lysine (%)	0.85	0.9
Calrorie (cal/g)	3550	3450

Table 2. Fatty acid composition of M. *longissimus* muscle between conventional and organic pork

	Conventional (n=30)		Organic (n=30)	
	Mean	SE	Mean	SE
Saturated fatty acids (%)	37.16 ^{A}	0.20	34.61 ^{B}	0.24
Unsaturated fatty acids (%)	62.84 ^{B}	0.20	65.39 ^{A}	0.24
Monounsaturated fatty acids (%)	48.37 ^{A}	0.38	42.48 ^{B}	0.48
Polyunsaturated fatty acids (%)	14.47 ^{B}	0.44	22.91 ^{A}	0.59
PUFA n-3	0.47 ^{B}	0.07	1.84 ^{A}	0.07
PUFA n-6	14.00 ^{B}	0.44	21.07 ^{A}	0.56
PUFAn-6/PUFAn-3	25.33 ^{A}	1.56	11.92 ^{B}	0.14
MUFA/SFA	1.30 ^{A}	0.01	1.23 ^{B}	0.01
PUFA/SFA	0.39 ^{B}	0.01	0.66 ^{A}	0.02

$^{A-B}$: Values with different superscripts in the same row differ significantly (P<0.05)
The symbols used mean as followed: MUFA, PUFA and SFA refer to Monounsaturated, Polyunsaturated and Saturated fatty acid, respectively.

Table 3. Meat characteristics of M. *longissimus* muscle between conventional and organic pigs

	Conventional (n=30)		Organic (n=30)	
	Mean	SE	Mean	SE
Cooking loss	33.50	0.55	31.06	1.24
Shear force	3.89 ^{A}	0.20	3.23 ^{B}	0.11
WHC	59.44 ^{B}	0.79	63.06 ^{A}	0.57
Juiciness	4.34	0.10	4.57	0.12
Tenderness	4.53	0.11	4.66	0.36
Aroma	4.62	0.09	4.86	0.08
Hardness	-2.64	0.11	-2.61	0.11
Springiness	-26.72 ^{A}	0.26	-29.85 ^{B}	0.43
Cohesiveness	0.69 ^{A}	0.01	0.54 ^{B}	0.04
Gumminess	-1.81 ^{B}	0.07	-1.37 ^{A}	0.10
Chewiness	48.32 ^{A}	1.98	40.38 ^{B}	2.35

$^{A-B}$: Values with different superscripts in the same row differ significantly (P<0.05)

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