EFFECT OF VACCENIC ACID IN PIG DIET ON FATTY ACID COMPOSITION IN MUSCLE TISSUE

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Abstract

The objective of the study was to evaluate the effect of vaccenic acid addition to pig feed mixture on fatty acid content in pork. Thirty two pigs (Czech Landrace x Czech Large White) x line 48 were included into the experiment. Animals were divided into two groups – control (V0) and experimental (V1) with vaccenic acid product (2kg/t of feed mixture, one month before the end of the fattening period). Pigs were slaughtered at the end of experiment and *M.longissimus dorsi* samples were taken 24 h *post mortem*. The content of fatty acids was measured by gas chromatography. Vaccenic acid in pig diet significantly ($P<0.01$) increased content of CLA (C18:2 (9,11) isomer) from 0.097 ± 0.02 g/100g of total fatty acids in V0 group to 0.142 ± 0.05 g/100g in V1 group. Significantly lower ($P<0.05$) content of DHA was found in V1 group. Content of total saturated fatty acids was slightly increased but the result was not significant ($P>0.05$). The decrease of total unsaturated fatty acids was also not significant. MUFA content was higher in V1 group compared to V0 group (44.38 ± 2.58 vs. 43.47 ± 3.60 g/100g, $P>0.05$). On the contrary, PUFA content was in V1 group lower. The n-6/n-3 PUFA ratio was not influenced by the diet ($P>0.05$).

Key Words: Pig, vacenic acid, CLA, fatty acid

Introduction

In recent years the interest in conjugated linoleic acid (CLA) which is important for human health was increased (Sebedio, 1997). CLA is a collective term for group of positional and geometric isomers of linoleic acid with conjugated double bond system (Hur et al., 2007). Effect of feeding CLA on change in pig performance, carcasss composition, change of saturated and unsaturated fatty acids content, lipid oxidation and meat colour was investigated by Thiel-Cooper et al. (2001), Dugan et al. (2003) and Sun et al. (2004). The CLA concentration in meat depends on CLA content in feed. Dietary CLA was incorporated into pig tissues and had positive effects on performance and body composition and positively effects the health of consumers.

The primary source of dietary vaccenic acid (VA) is milk and meat fat and is the only naturally occurring trans fatty acid. It is the precursor for CLA. Vaccenic acid is efficiently converted to c9,t11-18:2 CLA by the delta-9 desaturase enzyme system. It can also be elongated and desaturased to produce long chain fatty acids.

Animal and human studies show that dietary CLA has a number of benefits – increased lean meat content, decrease fat tissue, improves physiological stress response, favourably influenced immune system, inhibition of tumours (Burge and Wooton, 2002).

Material and Methods

Thirty two pigs (Czech Landrace x Czech Large White) x line 48 were included into the experiment. Gilts and barrows were equally divided in control (V0) and experimental (V1) groups. Pigs were fed with feed mixture for finishers. The product with vaccenic acid (2kg/t) was added to feed mixture for V1 group one month before the end of the experiment. The access to feed and water was *ad libitum.* Pigs were slaughtered at average body weight of 116.25 kg. Meat samples from *M. longissimus dorsi* were collected 24 h *post mortem*. Samples were frozen (-18°C) in plastic bags. Fatty acid content were determine by gas chromatography method. The lipid fraction was isolated by the method according to Folch et al. (1957), the preparation of the fatty acid methyl esters was done in accordance with CSN ISO 5509, fatty acid methyl esters were analysed by gas chromatography (6890N Agilent Technologies) according to CSN ISO 5508. The statistical evaluation was performed using the computer program QCExpert (TriloByte Statistical Software Ltd.) – t-test was used to evaluate statistical significancy of differences between control and experimental group. Data were presented as the mean, standard deviation (SD) and the significance levels.

Results and Discussion

The content of selected fatty acids in V0 and V1 groups is noted in Table 1. The content of CLA- *cis9, trans11* isomer was found higher ($P<0.01$) in V1 group (0.142 ±0.05 g/100g of total fatty acids) compared to control V0 group (0.097 ± 0.02 g/100g). It is illustrated in Figure 1. But the amount of isomer *trans10,cis12* was not affected by vaccenic acid addition to the feed mixture ($P>0.05$). Thiel-Cooper et al. (2001) and Hur et al.(2007) studied the effect of dietary CLA on fatty acid composition in pork. They found higher content of CLA in muscle and fat tissue of experimental pigs. Lauridsen et al. (2005)

detected in muscle tissue of CLA fed pigs a higher deposition of *c9,t11* isomer than *t10, c12* isomer.

The content of essential fatty acids linoleic and alpha-linolenic was decreased (P>0.05) in V1 group (10.38 ± 1.92 and 0.59 ± 0.15 g/100g) in comparison to V0 group (11.26 ± 2.58 and 0.68 ± 0.27 g/100 g). The amount of arachidonic acid was observed significantly lower (P<0.05) in experimental V1 group (2.08 ± 0.50 g/100g) contrast to V0 (2.18 ± 0.54 g/100g). Bee (2001) also found decreased content of arachidonic acid in pigs fed CLA diet.

The saturated fatty acid (SFA) content was slightly increased in V1 group but the result was not statistically significant (P>0.05). The higher content of SFA was also observed in the experiments of Bee (2001) and Corino et al. (2006). The monounsaturated acid (MUFA) content was higher in V1 group (P>0.05) but polyunsaturated fatty acid (PUFA) concentration was lower in this experimental group (P>0.05). On the contrary, Corino et al. (2006) found decreased MUFA content in CLA fed pigs.

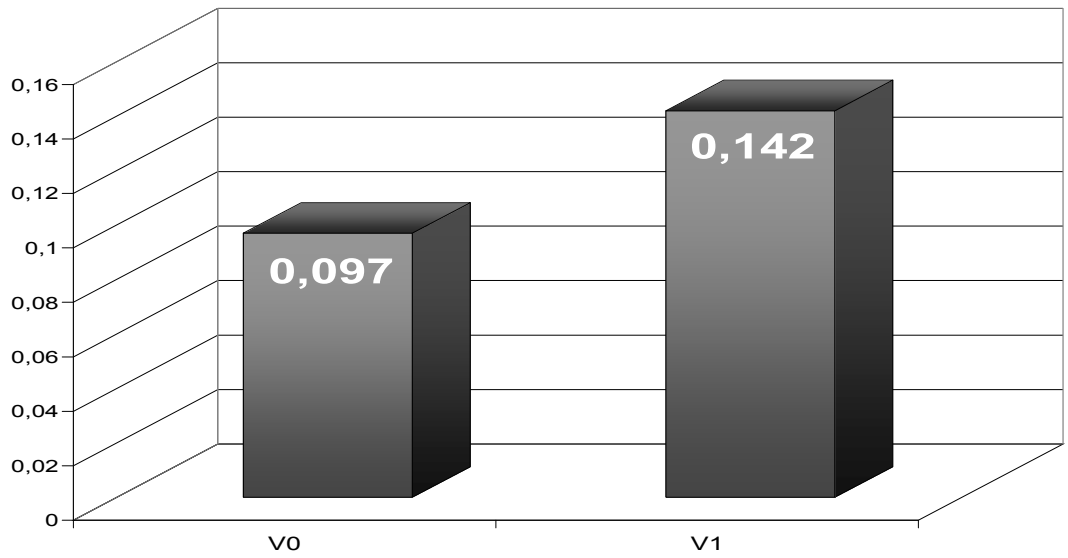
An important indicator of meat nutritional quality is n-6/ n-3 PUFA ratio. There was not a significant change of this ratio in our experiment (P>0.05).

Table 1. The content of fatty acids (g/100g of total fatty acids) in control and experimental group

Fatty acid	V0 –control group	V1 – experimental group
CLA c9, t11	0.097 ± 0.02 ^{B}	0.142 ±0.05 ^{A}
CLA t10,c12	0.03 ± 0.01	0.04 ± 0.01
Linoleic	11.26 ± 2.58	10.38 ± 1.92
Alpha-linolenic	0.68 ± 0.27	0.59 ± 0.15
Arachidonic	2.18 ± 0.54 ^{b}	2.08 ± 0.50 ^{a}
Total SFA	41.18 ± 1.66	41.34 ± 2.12
Total MUFA	43.48 ± 3.60	44.38 ± 2.58
Total PUFA	15.35 ± 3.35	14.29 ± 2.41
n-6/n-3 PUFA	13.90 ± 1.99	14.11 ± 1.61

a,b - P<0.05 A,B - P<0.01

Figure 1. CLA (c9, t11 isomer) content (g/100g) in muscle tissue of control and experimental pigs



Conclusion

The addition of vaccenic acid to feed mixture significantly affected CLA content in muscle tissue of fattening pigs. The consequent experiments should be performed to determine the most effective amount of vaccenic acid in pig diet.

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