WALAILAK JOURNAL

Short Communication

A Study on the Fatty Acid Profile and Conjugated Linoleic Acid (CLA) Content in Common Thai Indigenous Chickens Raised by Natural Farming in Nakhon Phanom Province

Tanom TATHONG and Santisook WORRAWATTANATAM

Program in Animal Science, Nakhon Phanom Collage of Agriculture and Technology, Nakhon Phanom University, Nakhon Phanom 48000, Thailand

(Corresponding author; e-mail: bangson_tim@hotmail.com and tanomi@npu.ac.th)

Received: 5th April 2010, Revised: 15th June 2010, Accepted: 6th July 2010

Abstract

This research studied the fatty acid profile and conjugated linoleic acid (CLA) content in common Thai indigenous chickens (5 months old) raised by natural farming in Nakhon Phanom province. One hundred and ten chickens (55 females and 55 males) with an average weight of 955 g and 1,050 g for females and males respectively were selected for the experiment. The chickens were randomly selected and meat samples were collected to determine the fatty acid profile and CLA content. The results showed that the saturated fatty acids (SFA) in males were composed mainly of C16:0, C14:0 and C15:0 while in females they were composed of C22:0, C15:0 and C16:0. The most common monounsaturated fatty acids (MUFA) in males and females were C24:1 and C15:1 respectively. The most common polyunsaturated fatty acid (PUFA) for both males and females was C20:3n3. The highest CLA profile was found in chicken meat cis9trans11 in males and females. The total fatty acid profile in breast meat showed that males had higher amounts of MUFA than females ($p < 0.05$) but that females had higher amounts of SFA and CLA than males ($p < 0.05$) while the amount of PUFA was similar in both males and females ($p > 0.05$).

Keywords: Fatty acid profile, conjugated linoleic acid, common Thai indigenous chicken

Introduction

Conjugated linoleic acid (CLA) is a group of geometric and positional isomers of linoleic acid. It is an end product of bacterial metabolism of fatty acids. Ruminant synthesis and absorption of CLA from the digestive tract allow this fatty acid to be incorporated into milk and fat tissue. CLA isomers are generated by heating linoleic acid in the presence of base. The CLA isomers are linked to a multitude of metabolic actions, including reduced rate of fat accretion, increased saturation of fat, altered immune response, inhibition of carcinogenesis, and reduced serum lipid [1,2].

Indigenous chicken farmers mostly use a natural rearing system. The survey of the number of Poultry Livestock Office in Nakhon Phanom province in 2005 found a total of 1,252,374 native chickens although these farmers also raised some ducks (7.69 %) on their farms. The native Thai chicken is more popular for the consumer due to the specific and special taste of native chickens. This causes native chickens to be in greater demand and thus of higher value in the market. In addition, native chickens can be produced more easily due to their higher resistance to both disease and environment pressures. The concept of the framework of this research project was to study the carcass quality and composition of common Thai indigenous chickens. The fatty acid profile including CLA were determined this data will benefits to consumers.

Objectives

1. To study the fatty acid profile and CLA content in breast meat.

2. To study the effect of sex on the concentration of fatty acid and CLA content in chickens.

Materials and methods

The experiment was conducted by using Thai indigenous chickens. Five months old native chickens were selected from 9 farms selected by the Livestock Officers in Nakhon Phanom province. One hundred and ten indigenous chickens were reared naturally. (55 females with an average weight of 955 g and 55 males with an average body weight of 1,050 g) to study the fatty acid profile and CLA content.

The twenty breast meats were collected from male and female chickens, and samples were analytical determined for fatty acid profile and concentration using gas chromatography according to previously published procedures [1,3].

Analysis

All data determined for analysis of variance. The mean of all data were also compared between sex of chicken at 95 % of group t-test using the SPSS version 11.5 program.

Results and discussion

The highest SFA percentages found in the breast meat of male chickens raised by natural farming were C16:0, C14:0 and C15:0. However, the highest SFA percentages in females were C22:0, C15:0 and C16:0. The lowest SFA percentages found in breast meat were C24:0 and C20:0 for males and females respectively (**Table 1**). C16:0 was a major fatty acid in the breast meat of native chickens. The SFAs which were not available in males were C17:0, C20:0 and C21:0.

Table 1 Saturated fatty acid (SFA) in breast meat of common Thai indigenous chicken raised by natural farming (% total fatty acid).

Fatty acid profile	Male	Female
C10:0	1.81	2.07
C11:0	5.98	4.68
C12:0	5.74	0.84
C13:0	1.07	4.10
C14:0	7.70	6.76
C15:0	7.41	7.60
C16:0	9.11	7.21
C17:0	NA	1.73
C20:0	NA	0.27
C21:0	NA	2.56
C22:0	3.22	7.84
C24:0	0.60	0.29

NA : Not available

Table 2 Monounsaturated fatty acid (MUFA) in breast meat of common Thai indigenous chicken raised by natural farming (% total fatty acid).

Fatty acid profile	Male	Female
C14:1	2.48	NA
C15:1	3.48	5.38
C18:1n9c	5.89	3.80
C22:1n9	NA	0.36
C22:1	6.25	3.31
C24:1	7.60	2.81

NA : Not available

Table 2 shows the most common MUFAs in males and females breast meat of common Thai indigenous chicken raised by natural farming were for C24:1 and C15:1. While the lowest MUFA percentages in males and females were C14:1 and C22:1n9. The MUFAs which were not available in males was C22:1n9 and in females was C14:1. **Table 3** shows that the most common PUFAs in male and female breast meat of common Thai indigenous chickens raised by natural farming was C20:3n3 while the lowest in males was C18:2n6c and in females was C20:2. The other fatty acid profile showed that C20:2 was not found in male chickens. The PUFAs which were not available in both males and females were C18:3n3, C20:2 and C20:5n6. **Table 4** shows the CLA profile in the breast meat of common Thai indigenous chicken raised by natural farming. The major components of the CLA were C18:2 (trans10cis12) and C18:2 (cis9trans11) [4] with the males showing higher values than the females. The observation of [1] suggests that the source of CLA was the grass feed that can be a residue in meat.

Table 3 Polyunsaturated fatty acid (PUFA) in breast meat of common Thai indigenous chicken raised by natural farming (% total fatty acid).

Fatty acid profile	Male	Female
C18:2n6t	3.18	2.82
C18:2n6c	1.27	5.41
C18:2	10.36	6.99
C18:3	4.41	4.87
C18:3n3	NA	1.09
C20:2	NA	3.20
C20:5n6	NA	0.60

NA : Not available

Table 4 Conjugated linoleic acid (CLA) in breast meat of common Thai indigenous chicken raised by natural farming (% total fatty acid).

Fatty acid profile	Male	Female
CLA cis9trans11	7.22	6.14
CLA trans10cis12	1.87	1.62
other	3.42	5.60

Table 5 Total fatty acid in breast meat of common Thai indigenous chicken raised by natural farming (% total fatty acid).

Type of fatty acid profile	Fatty acid content		SEM	*P-value*
	Male	Female		
SFA	42.65[b]	45.95[a]	0.704	0.019
MUFA	25.68[a]	15.69[b]	0.685	0.016
PUFA	19.21	24.99	1.094	0.424
CLA	12.46[b]	13.37[a]	0.958	0.020
Total	**100**	**100**	**-**	**-**

[ab] within the rows means bearing the same superscript differ significantly at $p < 0.05$.

The MUFA in the breast meat of males (**Table 5**) was higher than in females ($p < 0.05$) but SFA and CLA were higher in females than males ($p < 0.05$) while PUFA was similar for males and females ($p > 0.05$). This may be because the basal metabolic rate (BMR) in females is lower than males thereby consuming more energy consumption. Moreover, during the reproductive phase the amount of fat in the meat of females is known to increase [5].

Conclusions

The fatty acid profile and CLA content of common Thai indigenous chicken raised by natural farming showed that the most common SFAs in males were C16:0, C14:0 and C15:0 while in females they were C22:0, C15:0 and C16:0. The SFA with the lowest percentage was C24:0 and C20:0 for males and females respectively. The C16:0 was the major fatty acid in breast meat. The SFAs not available in males were C17:0, C20:0 and C21:0.

The major MUFA in males was C24:1 and in females was C15:1. While the least common MUFA in males was C14:1 and in females was C22:1n9. The MUFA not available was C22:1n9 and C14:1 in males and females, respectively.

The major PUFA in males and females was C20:3n3 while the least common in males was C18:2n6c and in females was C20:2. Furthermore, C20:2 was not found in male chickens. The PUFA not available in both males and females were C18:3n3, C20:2 and C20:5n6.

The highest CLA profile in male was CLA trans10cis12 and in female was cis9trans11. The data also showed that male had higher CLA content than female.

The MUFA in breast meat in male (**Table 5**) was higher concentration than female ($p < 0.05$) but SFA and CLA were higher in female than male ($p < 0.05$) while PUFA was similar between male and female ($p > 0.05$). Because, the basal metabolic rate (BMR) in female had used less than male such as make use of energy consumption in male animals than in female. Especially during the reproductive fat in meat is more [5].

Acknowledgements

This research was supported by Research and Development Institute, Nakhon Phanom University.

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