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“Industry based on Knowledges”

17th-19th November 2016, Convention Hall, Andalas University

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Animal Science Faculty of Andalas University
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Organized by:

Animal Science Faculty of Andalas University
and
Alumbi Center of Universiti Putra Malaysia

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Growth and Carcass Characteristic in Kampong x Broiler Crossbred Divergently Selected for Unsaturated Fatty Acid

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Abstract

Unsaturated fatty acid is one of the group fatty acid composition which is important for human health. The objective of this study was to identify the growth and carcass characteristic in Kampong x Broiler crossbred chicken in divergent unsaturated fatty acid. The highest unsaturated fatty acid were divide into to two group (high and low), where high dan low sample had value were 58.87% and 50.43% respectively. The data were analyse using t-test to observe carcass characteristic between high and low unsaturated fatty acid. The result showed there were not significantly ($P>0.05$) differences in growth (body weight) and carcass characteristic (carcass weight, breast muscle weight, and leg muscle weight) between to selected group. Divergent selection base on unsaturated in Kampong x Broiler crossbred chicken could provide a usefull model for genetics studies of fatty acid content related trait.

Keywords : Broiler, carcass characteristic, kampong chicken, unsaturated fatty acid

1. Introduction

Kampong chicken is a native chicken from Indonesia. Kampong chicken is slow growth and lean meat type chicken but it has adaptability and resistancy to disease. Broiler is fast growth and fatty meat type chicken. Crossbreeding program hopefully can increase meat quality, growth, adaptability and resistancy. Fatty acid composition is closely related to the nutritive value and the teste of meat. Fatty acids play an important role in the component of meat quality such as tenderness, shelf life, and flavour [1]. Fatty acid were divide into saturated and unsaturated fatty acid. Saturated fatty acid such as C14:0 and C16:0 are risk factors for cardiovascular diseases [2]. In contrast, unsaturated fatty acids are beneficial to human health which have function to decrease the circulating concentration of low density lipoprotein (LDL)-cholesterol by increasing hepatic LDL receptor activity [3].

Unsaturated fatty acid are hydrocarbon chain containing at least one carbon-carbon double bond. In the UK, the major dietary sources of unsaturated fatty acids include meat and meat products. A well-established risk factor for cardiovascular disease is an elevated plasma low density lipoprotein (LDL) cholesterol concentration. Replacing saturated fatty acids with either monounsaturated fatty acids or n-6 PUFAs reduces LDL (the 'bad') cholesterol, and so reduces the risk of developing the disease. Unsaturated fatty acids, such as linoleic acid or monounsaturated fatty acids, also slightly raise high density lipoprotein (HDL) (the 'good') cholesterol, which assist in the removal of triacylglycerols from the bloodstream [4]. Previous studies have shown that diets rich in unsaturated fatty acids (UFA) led to lower fat content [5].

There is some evidence fat deposition such as intramuscular fat were are subject to

different regulatory mechanism such as growth, carcass characteristic and meat quality in chicken [6]. The aim of this study was to examine the consequences of divergent selection for unsaturated fatty acid content on growth and carcass characteristic in Kampong x Broiler crossbred chicken.

2. Material and Methods

2.1. Samples

Tissue samples and phenotypes were collected from the Kampong x Broiler crossbred chicken. Ten chicken were selected from a pool 62 chicken as according to unsaturated fatty acid value. Among the ten chickens use in unsaturated fatty acid study, five chickens were classified as extremely high and low unsaturated fatty acid level and consider for this study.

2.2. Fatty Acids Analysis

Fatty acid analysis was determined by Soxhlet extraction method. Fatty acid analysis was done using Soxhlet method at Integrated Laboratorium at Bogor Agricultural University.

2.3. Statistical Analysis

Differences between value from unsaturated fatty acid related to growth and carcass characteristic were analyse by the paired t-test (SAS 9.1). Value of $p < 0.05$ were considered to indicate statistically significant differences. Pearson correlation coefficients were determined to know relationship between unsaturated fatty acid growth and carcass characteristic.

3. Result and Discussion

3.1 Unsaturated Fatty Acid Profile

We focused on unsaturated fatty acids that account for ~53 % of the total fatty acids (Table 1). The most abundant unsaturated fatty acid was C18:1n9c, followed by C18:2n6c and C16:1, across the populations analyzed. C18:1n9c is an unsaturated fatty acid that is constitutes one third of chicken meat fat [7].

C18:1n9c was the major monounsaturated fatty acid comprising 26.71% in the yolk, whereas C18:2n6c was the major polyunsaturated fatty acid in the fatty acid content of quail egg yolk [8]. C16:1 and C18:1 are product that converted from C16:0 and C18:0 through the SCD enzyme catalyzes a $\Delta 9$ -cis desaturation of a number of fatty acyl-CoA substrates with converted C16:0 to C16:1 and C18:0 to C18:1 [9].

3.2 Growth and Carcass Characteristic

The level of unsaturated fatty acid were not found significantly ($P > 0.05$) difference to growth trait (body weight) and carcass characteristic (carcass weight, breast muscle weight, and leg muscle weight) between to selected group (Table 2). Previous studies have shown that diets rich in unsaturated fatty acids (UFA) led to lower fat content (Sanz 2000) [5]. However, no difference between the content of IMF in leg [6] or breast muscle [10] was found between two lines divergently selected for abdominal fat percentage. Other researchers reported when using two types of essential unsaturated fatty acid (α -linoleic and α -linolenic) they observes differences which were highly significant ($P < 0.01$) for carcass weight and the weight of the chest and thigh [11]. This means that even the type of fatty acid affect the quality of mass parts.

Table 1. Profile divergent unsaturated fatty acid

Unsaturated Fatty Acid	Group	
	High	Low
C14:1	0.08 ± 0.02	0.08 ± 0.03
C16:1	2.63 ± 0.87	2.28 ± 0.52
C18:1n9t	0.18 ± 0.02	0.12 ± 0.03
C18:1n9c	33.71 ± 0.94	30.04 ± 1.69
C18:2n6c	21.93 ± 2.26	19.39 ± 0.39
C18:3n6	0.09 ± 0.01	0.08 ± 0.01
C20:2	0.16 ± 0.03	0.18 ± 0.03
C20:4n6	0.68 ± 0.21	1.12 ± 0.37
C22:6n3	0.06 ± 0.02	0.11 ± 0.04

Table 2. Descriptive statistic of growth and carcass characteristics with divergent unsaturated fatty acid

Carcass Characteristic	Group Unsaturated Fatty Acid	
	High	Low
Body Weight (g)	1086.00 ± 180.88	1127.60 ± 162.30
Chest Weight (g)	202.40 ± 35.41	205.00 ± 36.28
Carcass Weight (g)	679.60 ± 101.95	707.20 ± 118.53
Wing Weight (g)	98.60 ± 9.29	95.20 ± 17.27
Thigh Over Weight (g)	122.20 ± 22.63	118.00 ± 22.44
Thigh Down Weight (g)	110.80 ± 17.31	121.20 ± 23.97
Muscles Chest Weight (g)	145.60 ± 25.72	141.40 ± 35.14
Muscles Thigh Over Weight (g)	92.20 ± 22.11	87.40 ± 17.39
Muscles Thigh Down Weight (g)	71.20 ± 12.56	77.00 ± 14.82
Muscles Thigh Mayor Weight (g)	104.40 ± 20.73	101.00 ± 27.10
Muscles Thigh Minor Weight (g)	41.80 ± 5.76	39.80 ± 8.93

Table 3. Correlation of growth and carcass characteristics with divergent unsaturated fatty acid

Carcass Characteristic	Unsaturated Fatty Acids
Body Weight (g)	-0.03
Chest Weight (g)	-0.07
Carcass Weight (g)	-0.09
Wing Weight (g)	0.21
Thigh Over Weight (g)	0.15
Thigh Down Weight (g)	-0.20
Muscles Chest Weight (g)	0.10
Muscles Thigh Over Weight (g)	0.13
Muscles Thigh Down Weight (g)	-0.18
Muscles Thigh Mayor Weight (g)	0.12
Muscles Thigh Minor Weight (g)	0.11

3.3 Correlation between Growth and Carcass Characteristics With Divergent Unsaturated Fatty Acid

The correlation between unsaturated fatty acid with growth and carcass characteristic were variable with indication unfavourable correlation. Correlation analysis

between growth and carcass characteristics with divergent unsaturated fatty acid are summarised in Table 3. The range of correlation were -0.20 to 0.21. The high correlation coefficients evident between unsaturated fatty acid with wing weight (0.21). The low correlation were between

unsaturated fatty acid with tight down weight (-0.20). Aldai *et al.* (2007) [12] reported positive correlations ($P < 0.001$) were found between carcass conformation scores and unsaturated fatty acid ($r = 0.69$) group.

Conclusion

Unsaturated fatty acid profile was C18:1n9c, followed by C18:2n6c, and C16:1, across the populations analyzed. The divergent of unsaturated fatty acid was not significantly ($p > 0.05$) to growth and carcass characteristic between high and low sample. The correlation between unsaturated fatty acid with growth and carcass characteristic were variable with indication unfavourable correlation among the traits.

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