THE EFFECT OF LYSINE IN RATION ON ABDOMINAL FAT AND FEATHER GROWTH OF SEVERAL STRAINS OF BROILER CHICKENS

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ABSTRACT

The purpose of this study was to investigate the effects of lysine concentration in ration, on the weight of abdominal fat and the growth rate of primary feathers. Three strains of broilers were used including AA (Indian River), BB (Lohmann) and CC (Ross). One hundred and twenty of one day old chickens were used for up to six weeks of age and each strain consisted of 20 males and 20 females which were treated separately. All rations were formulated as an iso-nitrogeneous and iso-calory (starter diet containing 21% crude protein and 3000 kcal ME/kg diets, finisher diets containing 19% crude protein and 3000 kcal ME/kg diets). Five different levels of lysine used in this experiment were 0.94% (R1), 1.04% (R2), 1.14% (R3), 1.24% (R4) and 1.34% (R5). Feed and water were provided *ad libitum*. The data obtained were subjected to analyze of variance based on (3x2x5) Factorial Completely Randomized Design. Any different between treatment means were analyzed by Honestly Significant Different. The results showed that there were significant effects ($P<.01$) on the percentage of abdominal fat and feather weight between strains and sexes. They are also significant difference between strains and lysine levels in diet. There were significant interaction between strains, sexes and lysine levels on the percentage of feather weight. Strain AA (Indian River) showed wider and longer on the primary feather for female than male broiler chickens.

Key words : Lysine, Feather, Broiler

INTRODUCTION

Broiler is an alternative source of protein requirement for Indonesian society due to its high productivity within a relatively short period. It is therefore becoming a concern for the government to beef up the development of poultry industry throughout Indonesia (AAK, 1992).

Feed is regarded as a major factor in the development of poultry farms since it is important for animal life and biological process. High value of nutrients such as amino acids should be then available in ration, in particularly for lysine (Anggorodi, 1980). However, there is only limited amount of lysine available in most grain for animal feed. Supplementation of lysine is necessary to be given into a ration with an accurate amount, since insufficient amount of this compound may lead to increase accumulation of abdominal fat and decrease feather pigmentation in broiler (Scott *et al.*, 1982). Fat accumulation is known to be depend on strain, sex and ration in broiler (Linn, 1982). It has been confirmed by Iskandar (1988) that a positive interaction was found between a concentration of lysine and strain and the requirement of lysine depend on various strains of chicken. The purpose of the present study is to investigate the effect of different levels of lysine in ration against abdominal fat and feather growth in different strains of broiler. Hypothesis will be assessed include : 1) every strains will require different amount of lysine, 2) supplementation of lysine into the basal diet will lead to reduce abdominal fat, 3) levels of abdominal fat accumulation will be affected accordingly to strains and sexes, and 4) lysine will affect the growth of feather weight.

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MATERIALS AND METHOD

One hundred and twenty birds of 25% total population from 3 different strains (each strain consisting of 40 birds) were used in this experiment for analysis of abdominal fat, feather weight and feather growth rate of primary wings. A factorial completely randomized of 3 strains x 2 sexes x 5 levels of lysine was designed for statistical analysis strains of bird included Indian River (AA); Lohmann (BB) and Ross (CC) and each combination of treatments was conducted for 2 times to which 2 samples of bird were collected randomly from each group.

All rations were formulated as an iso-nitrogeneous and iso-calory (starter diet containing 21% crude protein and 3000 kcal ME/kg diets, finisher diets containing 19% crude protein and 3000 kcal ME/kg diets). Five different levels of lysine used in this experiment were 0.94% (R1), 1.04% (R2), 1.14% (R3), 1.24% (R4) and 1.34% (R5). Feed and water were provided *ad libitum*.

All birds were fasted for 8-10 hours previously to the termination at the age of 6 weeks old for carcass analysis to reduce intestinal content and to avoid postmortem autolysis. Weight of abdominal fat (%) was calculated as :

$$= \frac{\text{Abdominal fat weight}}{\text{Carcass weight}} \times 100\ \%$$

Growth rate of primary wing feather was assessed every 2 weeks for 6 weeks respectively. Two birds were collected from each treatment and strain both female and male birds for the measurement of length and width of feather.

Data were analyzed according to Factorial Randomized Completely Design for the significance under Honestly Significant Differences (Steel and Torrie, 1993).

RESULT AND DISCUSSION

Abdominal Fat Weight

The assessment of abdominal fat weight in three different strains (Indian River, Lohmann and Ross) of both female and male broilers fed on various levels of lysine supplement in their ration is shown in Table 1. The average abdominal fat weight seem to be similar in all strains of broiler ranging from 2.23% at the concentration of 1.14% lysine in ration to 2.53% at 1.34% lysine. The concentration of 1.34% lysine in ration appears to be effective to reduce abdominal fat. Chickens that fed on a diet containing suboptimal concentration of protein and amino acid would consume energy at a certain level to optimize protein intake to produce low fat formation (non fat) (Colin, 1986).

Furthermore, Scott *et al.* (1982) has also reported that insufficient content of lysine would increase abdominal fat formation. An appropriate supplementation of lysine in a diet could accelerate oxidation of fatty acid and glycerol since an increase production of ATP energy (Lehninger, 1990), while low fat production was due to an increase absorption of lysine. However, insufficient amount of lysine would lead to low production of ATP energy and small amount of fatty acid and glycerol being metabolized and eventually leading to fat accumulation.

Statistical analysis shows that supplementation of lysine in a ration up to 1.34% was not significantly affected the percentage of abdominal fat weight in broilers. This was suggested that the additional concentration of lysine into a ration was not optimal. Strains of chicken appear to be significantly affecting ($P<.01$) the percentage of abdominal fat weight to which Lohmann strain (2.76%) and Indian River strain (2.54%) have higher abdominal fat than Ross strain (1.87%). These results were consistently to the studies reported by Nordstrom *et al.* (1978) and Merkley *et al.* (1980) that there were significant differences between abdominal fat weight in 8 strains of broiler being tested.

Sex was significantly affecting ($P<.01$) the percentage of abdominal fat weight to which female birds (2.55%) have higher abdominal fat than male birds (2.23%). It was suggested to be due to the differences in hormonal system between female and male birds and females tend to accumulate fat more than males. Sturkie and Mueller (1976) that abdominal fat was not

Table 1. The Effects of Lysine Supplement in Abdominal Fat Weight (%) in Various Strains of Female and Male Broiler.

Treatment	Abdominal fat weight (%)	
	Female	Male
Lysine 0.94%		
Indian River Strain (AA)	2.71	1.99
Lohmann Strain (BB)	2.49	3.24
Ross Strain (CC)	1.70	1.81
Lysine 1.04%		
Indian River Strain (AA)	2.77	2.49
Lohmann Strain (BB)	3.10	2.59
Ross Strain (CC)	2.40	1.45
Lysine 1.14%		
Indian River Strain (AA)	3.16	2.06
Lohmann Strain (BB)	3.38	2.73
Ross Strain (CC)	1.79	2.10
Lysine 1.24%		
Indian River Strain (AA)	2.31	2.92
Lohmann Strain (BB)	2.84	2.12
Ross Strain (CC)	2.56	1.70
Lysine 1.34%		
Indian River Strain (AA)	2.25	2.75
Lohmann Strain (BB)	2.98	2.20
Ross Strain (CC)	1.89	1.30
Mean ± SE	2.56a ± 0.50	2.23b ± 0.55

Note : Subscripts indicates significantly (P<.01)

affected significantly by the interaction of lysine, strains and sexes have also confirmed this study.

Feather Weight and Primary Wings Feather Growth

The effect of different levels of lysine supplement on growth rate (width and height) of primary wings feather of male and female birds from three strains is illustrated in Table 2. Statistical analysis revealed that the concentration of lysine in a ration was significantly affecting (P<.01) feather weight in all birds. Chickens that were fed on 1.34% lysine supplement, had achieved the highest weight to 4.58% and lowest weight to 3.49% when fed on 1.04% lysine. The concentration of lysine at 1.34% appeared to be the optimal concentration to increase feather weight in these birds. Maharadunkasmi and Maryanto (1988) had also confirmed previously that an optimal concentration of lysine being supplemented into ration would lead to an increase of feather weight.

A significant interaction was also noted between strains and the concentration of lysine in ration (P<.01) to affect feather weight of chicken. Boorman and Burgess (1987) had also reported that strains were significantly interacting to the concentration of lysine in ration. Feather weight seemed to respond differently according to the concentration of lysine being supplemented into ration in this study. Indian River strain achieved highest weight when fed on 1.04% lysine supplement and lowest weight on 1.24% and 1.34% lysine. Lohmann strain showed that 0.94% and 1.34% lysine supplement produced highest weight and

Table 2. The effect of different levels of lysine supplement on growth rate (width and height) of primary wings feather of male and female birds

Treatments	Feather weight		Mean	Primary feather growth			
	Female (%)	Male (%)		Width (cm)		Height (cm)	
				Female	Male	Female	Male
Lysine 0.94%			3.92[b]				
Indian River Strain (AA)	4.55	3.60		16.2	15.4	12.9	12.1
Lohmann Strain (BB)	4.40	4.20		15.7	16.0	13.0	12.9
Ross Strain (CC)	3.15	3.60		14.2	13.9	12.1	12.2
Lysine 1.04%			3.49[c]				
Indian River Strain (AA)	4.65	3.90		15.9	15.5	13.6	12.5
Lohmann Strain (BB)	4.05	3.45		15.3	15.5	13.0	13.4
Ross Strain (CC)	2.50	2.45		14.4	14.1	12.3	12.6
Lysine 1.14%			4.06[b]				
Indian River Strain (AA)	4.25	2.90		16.1	15.0	13.6	12.9
Lohmann Strain (BB)	3.20	3.60		15.9	15.9	12.9	13.5
Ross Strain (CC)	4.55	5.85		14.6	13.9	12.5	12.5
Lysine 1.24%			3.63[b]				
Indian River Strain (AA)	2.55	3.75		15.2	15.3	12.3	12.7
Lohmann Strain (BB)	3.25	3.25		15.5	15.9	12.9	13.4
Ross Strain (CC)	4.60	4.40		14.1	14.1	12.3	12.0
Lysine 1.34%			4.58[b]				
Indian River Strain (AA)	3.85	4.75		15.4	16.2	13.6	13.2
Lohmann Strain (BB)	5.20	4.55		16.0	15.2	13.1	13.3
Ross Strain (CC)	5.05	4.15		14.0	14.3	12.2	12.3

1.14% produced lowest weight. Ross strain had achieved the highest weight at 1.14% and 1.24% lysine and lowest weight at 0.94% and 1.04% lysine. This study confirms the previous study reported by Iskandar (1988) that the requirement of lysine would be depended on each strains of chicken. It was also concluded that there was a significant interaction ($P<.01$) between strains, sexes and levels of lysine to affect feather weight in broilers.

Primary wings feather increased sharply/rapidly during 6 weeks. Table 2 revealed that female birds tend to have wider and higher primary wings feather than male birds in particular for the Indian River. The lowest growth rate of feather was noted in Ross strain fed on different levels of lysine supplement (0.94% to 1.34%) compared to Indian River and Lohmann.

The growth rate of feather (width and height) will increase rapidly following the age of chicken during 6 weeks period. Tanudimadja (1974) and Jull (1951) had also confirmed previously that primary wings feather increased rapidly from hatching period to 4 weeks old in chicken and an optimal growth was achieved at 6 weeks old.

CONCLUSION

1. Strains of bird were significantly affecting abdominal fat weight. Lohmann and Indian River had higher abdominal fat weight than Ross strain. Female birds accumulated/deposited more fat than male. The concentration of lysine supplement in ration was not significantly affecting the percentage of abdominal fat weight.

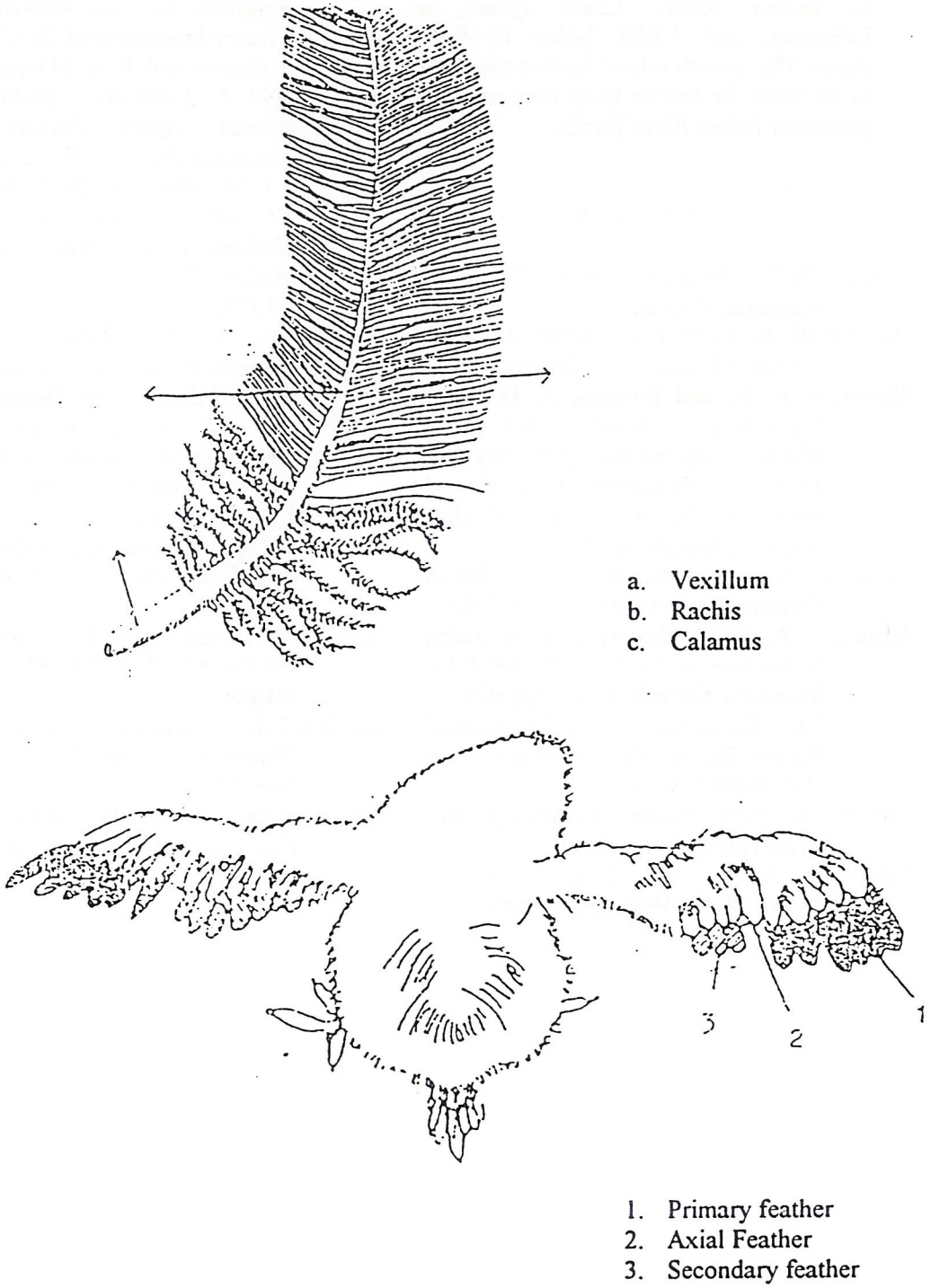

Illustration 1. Part of wing feather of chicken

2. A level of 1.34% lysine in a ration increased feather weight in broilers. There was interaction between strains, sexes and concentrations of lysine to feather weight. The requirement of lysine would be different among strains and sexes.
3. The optimal concentrations of lysine in ration to increase the growth rate of

primary wings feather were 1.04% lysine in Indian River; 1.34% lysine in Lohmann; and 1.14% lysine in Ross strain. The growth rate of feather appeared to be faster in female birds than male in particular Indian River Strain.

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