UNIVERSITI PUTRA MALAYSIA

GROWTH PERFORMANCE AND ANTIBODY PRODUCTION IN BROILER CHICKENS FED DIFFERENT LEVELS OF DL-METHIONINE AND L-METHIONINE UNDER HEAT STRESS CONDITION

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FP 2016 99

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A Project report Submitted to Faculty of Agriculture,

Universiti Putra Malaysia,

In Partial Fulfillment of the Requirement of SHW 4999

(Final Year Project)

For the Award of the Degree of

Bachelor of Agriculture (Animal Science)

Department of Animal Science

Faculty of Agriculture

Universiti Putra Malaysia

Serdang, Selangor

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2015/2016

CERTIFICATION

This project report entitled is **growth performance and antibody production in broiler chickens fed different levels of DL-methionine and L-methionine under heat stress condition** prepared by Mohd Khobib Khaisamah bin Malek and submitted to the Faculty of Agriculture in fulfillment of the requirement of SHW 4999 (Final Year Project) for the award of the degree of Bachelor of Agricultural Science Bachelor of Agriculture (Animal Science).

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ACKNOWLEDGEMENT

Bismillahirrahmanirrahim.

Alhamdulillah, my praise to Almighty Allah for giving me the power and will to undertake this study and peace be upon his Prophet Messenger Muhammad S.A.W.

I wish my sincere appreciation to my supervisor Prof. Dr. Zulkifli Idrus. I hope that one day I would become as good an advisor to my students as he has been to me. And my co-supervisor Dr. M. A. Hossain for their help, guidance, advises suggestions, comment and critics during the course of my study. I wish to express my deepest gratitude to my beloved parents Malek bin Endot and Riyahin bt Ab Ghani who helped me a lot and gave me endless moral and financial supports all the time of my study period in this university.

Lastly it is worth mentioning individual from I receive direct and indirect support and help. I am using this opportunity to express my gratitude to Siti Nurul Fatinah who always supported me anytime and anywhere until I finished this project. Thanks to En. Sharil, En. Ujang, En. Eddy En. Farhan, Cik Syikin and Cik Fatin all staff at Institute Research Centre of Tropical Agriculture. I would also like to thank my family s who always gives me moral support and my classmates for their time, kind help, understanding and patience in ensuring the successful completion of this study

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LIST OF ABBREVIATION

AA	Amino acid
ANOVA	Analysis of Variance
CRD	Complete Randomized Design
CP	Crude protein
DL-Met	DL-Methionine
DCP	Dicalcium phosphate
d	Day
DMRT	Duncan's Multiple Range Test
DLM	DL-methionine
ELISA	Enzyme linked immune-sorbent assay
g	Gram
HMB	Hydroxy-4- methylthio-butanoic acid
HS	Heat stress
ITA	Institute of Tropical Agriculture
kcal	Kilocalorie
Kg	Kilogram
L-Met	L-Methionine
ME	Metabolizable Energy
MJ	Mega joule
%	Percentage
ºC	Degree Celsius
SAS	Statistical analytical system
UPM	Universiti Putra Malaysia

GROWTH PERFORMANCE AND ANTIBODY PRODUCTION IN BROILER CHICKENS FED DIFFERENT LEVELS OF DL-METHIONINE AND L-METHIONINE UNDER HEAT STRESS CONDITION.

ABSTRACT

The experiment was conducted to determine the growth performance and immune response based on different level of DL and L met to the broiler chickens. All birds received a standard broiler starter diet from day 1 to 21. From day 22 to 42, equal number of birds (12 cages / diet) were fed isocaloric and isonitrogenous diets with various levels of DL-Met or L-Met supplementation; (i) 0% DL-Met or L-Met (as a negative control), (ii) 0.136% DL-Met, (iii) 0.136% L-Met. (iv) 0.153% DL-Met, (v) 0.153% L-Met, (vi) 0.170% DL-Met, (vii) 0.170% L-Met, (viii) 0.187% DL-Met, (ix) 0.187% L-Met, (x) 0.204% DL-Met, or (xi) 0.204% L-Met. For each dietary group, equal numbers of birds (6 cages per diet-temperature subgroup) were subjected to unheated (23^{o}C) or heated (32^{o}C for 6 hours/day) condition. Heat treatment depressed feed intake (day 22-42) and body weight (day 42) but had negligible effect on feed conversion ratios (FCR) (day 22 – 42). Irrespective of temperature, birds fed the negative control diet had significantly poorer FCR (day 22 – 42) than the other groups which did not differ. The day 42 body weights of the negative control chickens and those fed diet with 0.136% DL-Met were similar. However, the former had significantly lower body weights than the other groups. Diet had no significant effect on mortality rate of unheated birds. Within the heated group, except the negative control chickens, birds fed 0.136% DL-Met had significant higher mortality than others. It can be concluded that methionine supplementation can be lower (0.136% and 0.153%) than the Cobb recommended values without any detrimental effect on growth performance of broilers. Providing excess Met had no beneficial effect. Based on mortality rate under high temperature and live weight, it appears that L-Met has higher efficacy than DL-Met. There is no significant different between antibody production based on diet treatment and heat stress condition

PRESTASI TUMBESARAN DAN PENGHASILAN ANTIBODI BAGI AYAM PEDAGING DENGAN PEMBERIAN MAKANAN BERBEZA TAHAP DL DAN L METIONIN YANG BERBEZA DISTRESSKAN OLEH TEKANAN SUHU.

ABSTRAK

Satu experimen telah dijalankan untuk menentukan kadar prestasi pembesaran ayam serta tindak balas immuniti berdasarkan pemeberian kadar DL dan L methionine dalam diet bagi ayam pedaging. 660 jumlah ayam (Cobb) digunakan untuk tujuan kajian. Ayam tersebut di asingkan kepada 132 sangkar dan setiap sangkar mengandungi lima ekor. Ayam diberikan makanan yang biasa bermula dari hari petama sehingga hari 21. Pada hari 22 hingga 42, ayam tersebut telah diberikan kadar jumlah met yang berbeza. 0% (i) 0% DL-Met or L-Met (kontrol), (ii) 0.136% DL-Met, (iii) 0.136% L-Met. (iv) 0.153% DL-Met, (v) 0.153% L-Met, (vi) 0.170% DL-Met, (vii) 0.170% L-Met, (viii) 0.187% DL-Met, (ix) 0.187% L-Met, (x) 0.204% DL-Met, or (xi) 0.204% L-Met. Setiap diet dikenakan kadar suhu biasa (23ºC) atau (32ºC) selama 6 jam sehari. Tekanan suhu persekitaran mengurangkan kadar pengambilan makanan dan berat badan bagi ayam tetapi tidak memberi kesan kepada FCR. Berdasarkan tekanan suhu, nilai diet control menyebabkan FCR (hari ke 22-42) tinggi berbanding yang lain. Pemberian makanan tidak memberi kesan kepada kadar kematian di bawah suhu yang terkawal tetapi untuk 0.136 % sangat memberi kesan kepada kadar kematian. Kesimpulannya, kadar jumlah met boleh dikurangkan kepada (0.136% dan 0.153 %) daripada keperluan yang diperuntukkan kepada Cobb. Pemberian kadar met yang berlebihan tidak memberi kesan kepada prestasi tumbesaran ayam berdasarkan kadar kematian dan berat badan, hal ini dapat membuktikan bahawa L-met mempuyai kadar efisyen lebih tinggi berbanding DL-met. Berdasarkan immuniti respon. Perbezaan jumlah met dan tekanan suhu persekitaran tidak memberi kesan terhadap kadar pengeluaran antibodi kepda ayam pedaging.

CHAPTER 1

INTRODUCTION

Protein is a key nutrient in poultry nutrition and has a significant share in the cost of the diet formulation, directly influencing feed conversion, carcass quality, and weight gain of animals. The protein requirement of animals is more accurately a requirement for the building blocks of protein known as amino acids. The amino acids that cannot be produced by animals are referred to as essential amino acids. Methionine is one of the essential amino acids for poultry. Poultry have requirements for amino acids but not crude protein (Nascimento, 2004). Thus, a better understanding of the requirements of individual amino acid allows a more precise nutrition, offering the possibility for the formulator to partially replace the requirement of at least minimum levels of crude protein by essential amino acids requirements, generating lower costs for the producer and lower emissions to the environment (Suida, 2001). Methionine, an essential amino acid, is one of the two sulfur-containing amino acids. Amino acids can exist as D- or L isomers or mixture of two products.The D-isomers are biologically inactive while L-form is commonly occurring in most of the tissues. However, birds possess the ability to utilize both D and L-forms also called racemic mixture (Lesson and Summers, 2001). The availability of synthetic methionine supplements played a key role in the development of the modern poultry industry. The L isomer of methionine is present in natural sources of methionine, such as corn, soybeans, wheat, etc. D-methionine (D-Met) must be converted into the L form in order to be nutritionally active, and the conversion efficiency has been reported as 90% (Baker, 1994).The influence of protein and amino acid nutrition on physiological and metabolic reactions of broilers under hot climate has been

highlighted in earlier work (Gonzalez-Eaquerra and Leeson, 2006). Broilers eat less at high temperatures, in an attempt to maintain homeothermy. Hence, fortification with amino acids to counterbalance reduced intake is a logical approach. However, previous work suggested that fortifying diets with essential amino acids failed to improve performance of heat stressed broilers (Cheng *et al*., 1997; Zarate et al., 2003). Whether or not the requirements for specific amino acids change during heat stress seems to be controversial. Substantial work has been done on lysine requirements in broilers under hot climate (Mendes et al., 1997; Corzo *et al*., 2002). However, there is a lack of information on methionine requirement under heat stress condition.

It has been established that high environmental temperatures affect the development of a specific immune response in chickens (Pamok *et al*., 2009; Niu *et al*., 2009). Lymphoid organ weights, primary and secondary antibody responses, incidences of macrophages in abdominal exudate cells, and phagocytic ability of macrophages were all reduced by heat stress (Bartlett and Smith, 2003). The immunity in terms of antibody production to sheep erythrocytes increased with the concentration of methionine in the diet in the majority of genotypes, indicating a higher methionine requirement for immunity than for weight gain (Rama Roa et al., 2003). Hence, the effect of different levels of Met supplementation on antibody production in heat stressed chickens merits investigation. Thus, the objective of this study was to determine the effect of various levels offeed grade L-methionine and feed grade DL-methionine on growth performance and antibody response in broiler chicken exposed to high temperature. The hypothesis was L-Met has a higher biological efficacy than DL-Met and thus may be more beneficial to heat stressed broilers.

The study is of significance in determining the optimum level of feed grade DL-Met and L-Met for broilers under heat stress condition and in producing poultry feed economically. Research hypothesis is believes that bioavailability of L-methionine is higher than DL-methionine and L-methionine gave more effect in broiler fed compare than DL-methionine.

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