



**UNIVERSITI PUTRA MALAYSIA**

**THE DIETARY EFFECTS OF DL- AND L- METHIONINE ON BROILER  
CHICKEN GROWTH PERFORMANCE, CARCASS COMPOSITION AND  
INTESTINAL VILLI HEIGHT AND CRYPT DEPTH**

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BY

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## CERTIFICATION

This project report entitled The Dietary Effects of DL- And L- Methionine On Broiler Chicken Growth Performance, Carcass Composition and Intestinal Villi Height and Crypt Depth is prepared by Mohamad Amirul Asyraf Bin Zainudin and submitted to the Faculty of Agriculture in fulfilment of the requirement of SHW 4999 (Final Year Project) for the award of the degree of Bachelor of Agriculture (Animal Science).

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## TABLE OF CONTENTS

CONTENTS	PAGE
CERTIFICATION	i
ACKNOWLEDGEMENT	ii
TABLE OF CONTENT	iii
LIST OF TABLES	iv
LIST OF PLATES	v
LIST OF ABBREVIATIONS	vi
ABSTRACT	vii
ABSTRAK	viii
INTRODUCTION	1
LITERATURE REVIEW	5
MATERIAL AND METHODS	8
RESULT	13
DISCUSSION	16
CONCLUSION	19
REFERENCES	20
APPENDICES	23

## LIST OF TABLES

TABLE	PAGE
Table 1: The composition of experimental diets	9
Table 2: The calculated nutrients of experimental diets	10
Table 3: Table of growth performance result	13
Table 4: Table of carcass composition result	14
Table 5: Table of intestinal villus height and crypt depth result	15

## LIST OF PLATES

PLATE	PAGE
PLATE 1: Cut section of intestine sample	23
PLATE 2: Samples were embedded in wax	23
PLATE 3: Waxed samples left for cooling	23
PLATE 4: A ready waxed samples	23
PLATE 5: Wax sliced by microtome	24
PLATE 6: Sample been floated on water before placed on histological slide	24
PLATE 7: Slides were stained with haematoxylin and eosin	24
PLATE 8: Slides ready to be examined under microscope	24
PLATE 9: Sample of villus morphology 1	25
PLATE 10: Sample of villus morphology 2	25
PLATE 11: Sample of crypt morphology 1	25
PLATE 12: Sample of crypt morphology 2	25



## LIST OF ABBREVIATIONS

%	Percentage
µm	Micrometre
Met	Methionine
ANOVA	Analysis of Variance
FCR	Feed conversion ratio
HMB	Butanoic acid
<i>et al.</i>	and others
Kg	Kilogram
GSH	Glutathione
TAC	Total Antioxidant Capacity
GIT	Gastrointestinal tract
Kcal	Kilo calorie
ml	Millilitre
SAS	Statistical Analysis System
DCP	Dicalcium phosphate
P	Phosphorus

## ABSTRACT

This study was conducted to determine the dietary effect of DL- and L-Methionine on growth performance, carcass composition and intestinal villi height and crypt depth of broiler chicken. The study was conducted on five hundred and sixty Cobb 500 day old chicks raised for 35 days. The chicks were divided into four dietary treatments groups; each treatment had 7 replicate containing 20 chicks per replicate. Basal diet was formulated with corn and soybean at two stages; starter and finisher. Each treatment was supplemented with different level of DL- and L-Methionine. The level was 0.350% and 0.264% for starter while 0.260% and 0.179% for finisher. There is no significant difference found for growth performance especially feed conversion ratio (FCR) for each of the type and level of DL-Met and L-Met. For carcass composition, no significant result ( $P > 0.05$ ) was found for each of the treatment. No significant interaction ( $P > 0.05$ ) had be found between the type and level DL-Met and L-Met. Usage of different type and level of methionine showed significant result ( $P < 0.05$ ) on the villus height of jejunum and ileum as well as crypt depth for jejunum. There was no significant result ( $P > 0.05$ ) for villus height of duodenum and crypt depth of duodenum and ileum. Overall, there was no significant effect ( $P > 0.05$ ) between the type and level of DL-Methionine and L-Methionine on the villi height and crypt depth.

**Keywords:** Methionine, Growth performance, Carcass composition, Villus height, Crypt depth.

## **ABSTRAK**

*Kajian ini dijalankan untuk menentukan kesan pemakanan DL- dan L-Methionine terhadap prestasi tumbesaran, komposisi karkas dan ketinggian villi usus dan kedalaman krypt ayam daging. Kajian ini telah dijalankan ke atas 560 ekor anak ayam Cobb 500 yang berusia 1 hari dan dipelihara selama 35 hari. Anak ayam telah dibahagikan kepada empat kumpulan rawatan pemakanan; setiap rawatan mempunyai 7 replika yang mengandungi 20 anak ayam setiap replika. Diet asas terdiri daripada jagung dan kacang soya telah diformula untuk dua peringkat; starter dan finisher. Setiap rawatan telah ditambah dengan tahap DL- dan L-Methionine yang berbeza iaitu 0.350% dan 0.264% untuk starter manakala 0.260% dan 0.179% untuk finisher. Tiada hasil yang ketara dijumpai untuk prestasi tumbesaran terutama pada kadar pertukaran makanan (KPM) bagi setiap jenis dan tahap DL-Met dan L-Met. Untuk komposisi karkass, tiada keputusan yang signifikan ( $P > 0.05$ ) didapati bagi setiap rawatan. Tiada interaksi yang signifikan ( $P > 0.05$ ) boleh didapati di antara jenis dan tahap DL-Met dan L-Met. Penggunaan jenis dan tahap methionine yang berbeza menunjukkan hasil yang signifikan ( $P < 0.05$ ) pada ketinggian villus di jejunum dan ileum serta kedalaman krypt untuk jejunum. Tiada hasil yang signifikan ( $P > 0.05$ ) untuk ketinggian villus duodenum dan kedalaman krypt duodenum dan ileum. Secara keseluruhan, tidak ada kesan yang signifikan ( $P > 0.05$ ) antara jenis dan tahap DL-Methionine dan L-Methionine terhadap ketinggian villi dan kedalaman krypt.*

**Kata Kunci:** *Methionine, Kadar tumbesaran, Komposisi karkas, Ketinggian vilus, Kedalaman krypt.*

## CHAPTER 1

### INTRODUCTION

Dietary protein supply is one of the major factors influencing the productivity of farm animals. Supplementation of the diets of animals with amino acids to enhance the quality of the dietary protein is a common practice, particularly in the poultry and swine industries. The importance of amino acids to the industry has been one of the reasons that many aspects of amino acid metabolism in farm animals have been extensively studied. All of the amino acids, with the exception of glycine, have an optically active carbon atom to which the amino group and the carboxyl group are attached. In the vast majority of cases it is the L-isomer which is of metabolic and nutritional significance. In addition, amino acids also serve as important sources of energy, especially glucose. Some amino acids are also the precursors of other biologically important compounds, for example adrenaline and some of the bile salts.

Methionine is an essential amino acid in all species of animals. It is recognised as the first limiting amino acid especially in poultry and high-yield dairy cow. Methionine is considered to be the first limiting amino acid in broilers fed practical corn-soybean meal diets. The meaning of first limiting amino acid is if a diet is inadequate in any essential amino acid, protein synthesis cannot proceed beyond the rate at which that amino acid is available. Adequate dietary level of this amino acid is needed to support optimum growth and carcass yield of fast-growing commercial broilers (Ojano-Dirain and Waldroup, 2002). Methionine can enhance growth and maximise yield of meat, reduce carcass fat and balance nutrient intake.

There are two major types of Methionine that are commercially used in poultry feed, DL-Methionine and L-Methionine. Ribeiro (2015) states that the L-Met is commonly used in experiments and is considered as the reference standard, since only the L isomer of Methionine is deposited in the muscles or incorporated into enzymes by animals. The L isomer of methionine is present in natural sources of methionine, such as corn, soybeans, wheat, and others. In recent years, a number of studies have been done to determine the effects of DL-Methionine and L-Methionine on the carcass quality of the chicken. DL-Methionine is not utilized directly by the cells of the gastrointestinal tract until it is converted to L-Methionine in either the liver or the kidneys.

Continuous study about dietary of DL-Methionine and L-Methionine can help improving the livestock industry in Malaysia. Producers will be more educated on making a better decision to choose the right feed ration for the animal. Moreover, consumers also will get the benefit and improve their awareness on consuming healthy product that rewards a healthy body.

The objective of this study was to determine the dietary effect of DL and L methionine on broiler growth performance, carcass quality and intestinal villi height. The specific objectives were to evaluate the dietary effect of DL and L methionine on the growth performance of broiler chicken. Next is to evaluate the carcass quality of the chicken focusing more on the *pectoralis*, *bicep femoris*, wings and drumstick muscle. Lastly is to evaluate the dietary effect of DL and L methionine on the intestinal villus height in broiler chicken.

Studying the growth performance of boiler supplemented with DL-Methionine and L-Methionine are all about identifying the feed conversion ratio (FCR), body weight

gain, and feed intake throughout the experimental period. FCR is a method to determine the feed efficiency absorbs by the animal body that resulting in increasing of body weight. Theoretically, the lower the FCR is better as the broiler used low amount of feed to be converted into 1 kg.

The yield of carcass can give effect toward the quality and quantity of any industries that use meat as the main product. As in this case, broiler chicken can yield carcass or meat that desired by the demand from market within the given period. Most demanded parts of broiler are drumstick, breast, thigh and wings. These parts are highly demanded by the market as consumer preference on tasty meat. But from the view of industry, the weight / yield of broiler carcass can improve its quality thus increase its price.

Intestinal villi height is the measurement of the length of the villi from the tip of the villi to the the base called muscularis mucosa. *Villi play important role as it aligns along the small intestine of organism, assisting in absorption of important nutrients. Characteristic of villi are varies depending on the site its located. As for example, the villi located at the duodenum is shorter and wider than the villi that found at the jejunum.* Another important thing when studying the intestinal villi height is identifying the depth of crypt of *Lieberkühn* or also known as *intestinal gland*. *Its primary function is secreting enzyme which can ease the digestion of feeds.*

The hypothesis for the experiment was the growth performance, carcass quality and intestinal villi height of chicken fed with L-Methionine will give significance result compared to chicken fed with DL-Methionine. This is because the difference of the molecular structure of both methionine. L-Methionine is easily oxidised when digested and used compared to DL-Methionine. The effects of methionine were

significant in improving body weight and feed to gain and increasing breast yield of broilers (Esteve-Garcia and Mack, 2000). Amat (1996) states that it is assumed that an increased villus height is paralleled by an increased digestive and absorptive function of the intestine due to increased absorptive surface area, expression of brush border enzymes and nutrient transport systems.

Supplementing the methionine in chicken feed can be costly to the producer as those supplement is expensive. As methionine is the first limiting amino acid in chicken feed, it will be very important for the producer to know the correct amount of methionine needed to give to the chicken. But even knowing the adequate amount, the utilization of the amino acid will be not at the maximum as chicken will absorb more L-Methionine than DL-Methionine. This study was conducted to determine the difference on how efficient the utilization of DL-Methionine and L-Methionine. So, the producer can save cost and feed more L-Methionine than DL-Methionine. If the result has significance difference, the L-Methionine can completely replace the DL-Methionine in the ration of chicken feed.



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