



**UNIVERSITI PUTRA MALAYSIA**

**EFFECT OF PRE-STARTER DIET SUPPLEMENTED WITH HIGH  
ENERGY AND MOISTURE ON GROWTH PERFORMANCE OF BROILER  
CHICKEN**

**MUHAMAD NURAIMAN HASHIM**

**FP 2016 104**

EFFECT OF PRE-STARTER DIET SUPPLEMENTED WITH HIGH ENERGY AND  
MOISTURE ON GROWTH PERFORMANCE OF BROILER CHICKEN

MUHAMAD NURAIMAN BIN HASHIM



FACULTY OF AGRICULTURE

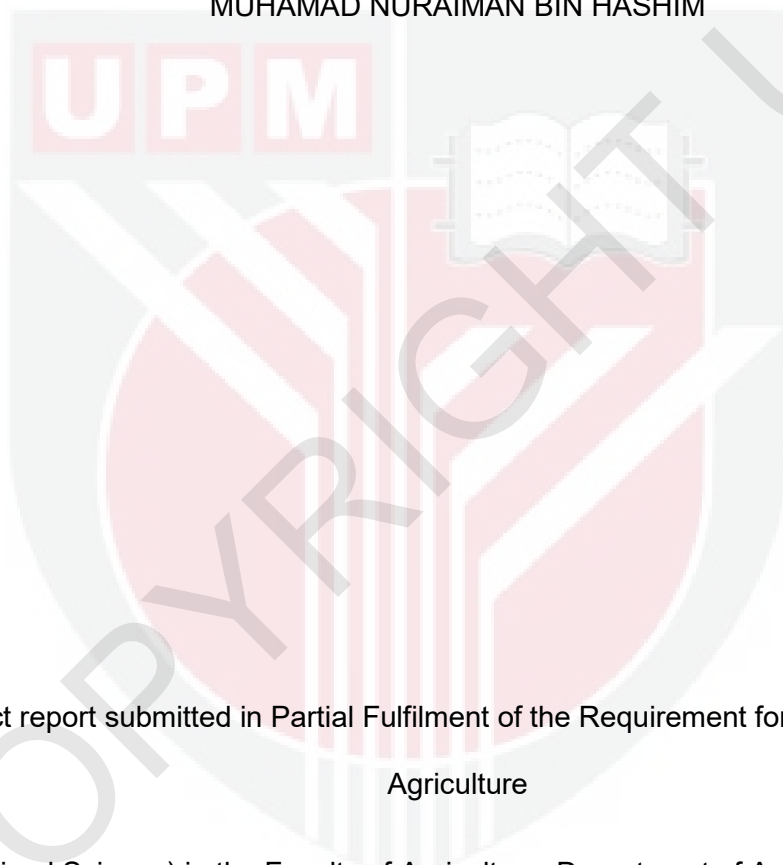
UNIVERSITI PUTRA MALAYSIA

SERDANG, SELANGOR

2015

**EFFECT OF PRE-STARTER DIET SUPPLEMENTED WITH HIGH ENERGY AND  
MOISTURE ON GROWTH PERFORMANCE OF BROILER CHICKEN**

MUHAMAD NURAIMAN BIN HASHIM



Project report submitted in Partial Fulfilment of the Requirement for the Bachelor of  
Agriculture

(Animal Science) in the Faculty of Agriculture, Department of Animal Science,

Universiti Putra Malaysia

2015/2016

CERTIFICATION FORM

This project report entitled **EFFECT OF PRE-STARTER DIET SUPPLEMENTED WITH HIGH ENERGY AND MOISTURE ON GROWTH PERFORMANCE OF BROILER CHICKEN** was prepared by **MUHAMAD NURAIMAN BIN HASHIM** and submitted to the Faculty of Agriculture in partial fulfilment of the requirement of SHW 4999 (Project) for the award of **Bachelor of Agriculture (Animal Science)**.

MUHAMAD NURAIMAN BIN HASHIM

Student's signature:

170001

Certified by:

\_\_\_\_\_  
Prof. Dr. Jothi Malar Panandam

Project Supervisor

Department of Animal Science

Faculty of Agriculture

University Putra Malaysia

Serdang, Selangor.

Date: \_\_\_\_\_

## ACKNOWLEDGMENT

First of all, I would like to express my highest gratitude to Allah for the chances and good health that enable me to complete these report writing.

I would also hereby to thank my supervisor, Prof. Dr. Jothi Malar Panandam, who helped me a lot throughout the entire project and patiently guide me through the whole project. I would also want to express my appreciation to Prof. Madya. Dr. Halimatun Yaakub for her assistance and guidance for completing my project. To Cik Kamariah (Animal Science Lab Assistance) , Puan Syafika (Aquaculture Lab Assistance), Puan Jamilah and Puan Latifah (Veterinary Lab Assistance) , a million thanks to them for helping me continuously until I managed to finish this project.

I would also like to thank the lecturers at the Department of Animal Science for their support and encouragement, and other staff for their help and sharing of knowledge. Not forgotten are my best friend, Ahmad Aiman and all my fellow friends who were always there to lend me a hand whenever I need. My biggest grateful for my family for their supportive and understanding throughout the project.

Thank you very much.

## TABLE OF CONTENTS

<b>TITLE PAGE</b>	i
<b>CERTIFICATION</b>	ii
<b>ACKNOWLEDGEMENT</b>	iii
<b>TABLES OF CONTENTS</b>	iv
<b>LIST OF TABLES</b>	vii
<b>LIST OF FIGURES</b>	viii
<b>LIST OF ABBREVIATIONS</b>	ix
<b>ABSTRACT</b>	x
<b>ABSTRAK</b>	xii
<b>CHAPTER 1: INTRODUCTION</b>	1
1.1 Objectives	3
1.2 Research Hypothesis	3
<b>CHAPTER 2: LITERATURE REVIEW</b>	4
2.1 Broiler Industry (Past, Present Issues and Future Potential)	4
2.2 Broiler Genetic Development	5
2.3 Feed Nutrition Formulation in Broiler Industry	6
2.3.1 Starter, Grower and Finisher Diet	7
2.3.2 Pre-starter diet	8
2.3.3 Moisture Content in Feed	9
2.3.4 Simple Sugar Content in Feed	9
2.4 Gastrointestinal Tract Morphology	10

<b>CHAPTER 3: MATERIALS AND METHODS</b>	<b>12</b>
3.1 Experimental Material	12
3.2 Treatments	12
3.3 Experimental Design	12
3.4 Housing and Management	13
3.4.1 Preparation for arrival of birds	13
3.4.2 Housing	13
3.4.3 Tagging	13
3.4.4 Heat and Lighting	14
3.4.5 Feed	14
3.4.6 Water	15
3.4.7 Vaccination	15
3.4.8 Hygienic and Health	16
3.5 Slaughter and Weighing	16
3.6 Carcass Characteristic and Sampling	17
3.7 Gastrointestinal Tract Morphometric	17
3.7.1 Fixing	18
3.7.2 Tissue Dehydration	18
3.7.3 Embedding	19
3.7.4 Sectioning	19
3.7.5 Staining	20
3.7.6 Mounting	21
3.7.7 Slide Analysis ( Intestinal Morphometric)	21
3.8 Parameters Studied	22
3.9 Statistical Analysis of Data	24

<b>CHAPTER 4: RESULTS</b>	25
4.1 Average Body Weight	25
4.2 Average Daily Weight Gain (ADG)	25
4.3 Average Daily Feed Intake (FI)	25
4.4 Feed Conversion Ratio (FCR)	29
4.5 Weight of organs	29
4.6 Weight of fats	30
4.7 Villus height	31
<b>CHAPTER 5: DISCUSSION</b>	32
5.1 Average Body Weight	32
5.2 Average Daily Weight Gain	32
5.3 Average Daily Feed Intake	33
5.4 Feed Conversion Ratio	33
5.5 Weight of organs and fats	33
5.6 Villus Height	34
5.7 Limitations of the study and Recommendation	35
<b>CHAPTER 6: CONCLUSION</b>	36
<b>REFERENCES</b>	38
<b>APENDIXES</b>	39



## LIST OF TABLES

<b>Table 2.1</b>	Production, Consumption and Self –Sufficiency Level of Broiler Industry in Malaysia from 1960-2010	5
<b>Table 2.2</b>	Specification of starter, grower and finisher of Cobb 500	8
<b>Table 3.1</b>	Treatment of samples and code	13
<b>Table 3.2</b>	Nutrient composition of the commercial rations.	15
<b>Table 4.1</b>	Means and standard errors for weight of birds fed with commercial diet, semi-moist diet, energy diet and semi-moist energy diet as pre-starter diet.	26
<b>Table 4.2</b>	Means and standard errors of average daily weight gain of birds fed with commercial diet, semi-moist diet, energy diet and semi-moist energy diet as pre-starter diet.	28
<b>Table 4.3</b>	Means and standard errors of average feed intake of birds fed with commercial diet, semi-moist diet, energy diet and semi-moist energy diet as pre-starter diet.	30
<b>Table 4.5</b>	Means and standard errors of organs weight for birds fed with commercial diet, semi-moist diet, energy diet and semi-moist energy diet as pre-starter diet.	32
<b>Table 4.6</b>	Means and standard errors of fat weight for birds fed with commercial diet, semi-moist diet, energy diet and semi-moist energy diet as pre-starter diet.	34

## LIST OF FIGURES

- Figure 4.4 Feed conversion ratio of birds fed with commercial diet, semi-moist diet, energy diet and semi-moist energy diet as pre-starter diet. 30
- Figure 4.7 Mean of villi height for birds fed with commercial diet, semi-moist diet, energy diet and semi-moist energy diet as pre-starter diet. 33



## LIST OF ABBREVIATIONS

Kcal ME/kg	kilocalorie Metabolizable Energy/kilogram
%	percentage
°C	degree Celcius
g	gram
min	minimum
max	maximum
DOC	day-old chick
ADG	Average Daily Gain
FI	Feed Intake
FCR	Feed Conversion Ration
C	Control diet treatment
SM	Semi-moist diet treatment
E	Energy diet treatment
SME	Semi-moist energy diet treatment

## ABSTRACT

Feed cost is the highest cost in the production of poultry, up to 70% of the total cost. A day reduced in rearing can save money from feeding cost especially in commercial farm where a large number of chicken are reared. Day old chicks have to go through a major shift of metabolic dependence from endogenous lipid-rich yolk to feed on exogenous carbohydrate and protein-rich feed. Pre-starter diet in highly digestible form may affect not only early development and growth of broiler chicken but also the performance at the end of rearing period thus optimizing their genetic potential for growth. The present study was conducted to investigate the effect of pre-starter diet with energy supplementation and diet with moisture on the body weight, feed conversion ratio (FCR), and carcass characteristic (weight of organs and fat) of broiler chicken. Sixty day-old Cobb 500 male broiler chicks were randomly assigned to four treatments with three replications, with five chickens in each replicate, for 42 days. The chicks were reared in cages. Treatments given were four pre-starter diets fed to the chicks from day 1 to day 7; the treatments included a control diet (commercial diet), diet supplemented with glucose (control diet with 4% glucose/kg diet), semi-moist diet (control diet with 0.3 L water/kg diet) and semi-moist diet with glucose. The semi-moist diets were prepared once in two days with inclusion of an anti-mould agent and was stored in closed containers. Feed and water were provided ad libitum. Two birds from each treatment group were randomly slaughtered at age of 42 days and the carcass evaluated. Birds on control and glucose supplemented diets had better FCR in the first week compared to birds on semi-moist diet. Feeding chicks with semi-moist diet supplemented with glucose showed better FCR ( $P<0.05$ ) and the highest body weight gain compared to the other treatment groups at week 6, followed by birds in the control group. Mean weight of abdominal fat (47.31 versus 29.84 g) were also significantly ( $P<0.05$ ) higher for birds fed with semi-moist diet supplemented by

glucose. However, there was no significant ( $P>0.05$ ) different in other organ weights (liver, heart, intestine and gizzard) and subcutaneous fat. It may be concluded that semi-moist pre-starter diet with inclusion of glucose would result in broiler chicken with higher body weight gain and lower visceral fat deposition at the end of the rearing period (six weeks). However, for the morphometric analysis, control diet treatment have the tallest villi height.



## ABSTRAK

Dalam kos pengeluaran unggas, kos makanan merupakan kos tertinggi, mencapai sehingga 70% kos keseluruhan. Kebolehpayaan pengurangan walau satu hari dalam penternakan ayam untuk mencapai berat badan boleh jual dapat menjimatkan kos makanan yang banyak terutamanya bagi ladang komersial di mana ayam ditenak dalam jumlah besar. Anak ayam berumur satu hari sedang mengalami perubahan besar dalam kebergantungan metabolisma iaitu dari metabolisma dalaman dari kuning telur yang kaya dengan lemak kepada kebergantungan metabolisma luaran dari sumber makanan yang kaya dengan karbohidrat dan protein. Diet pra-permulaan dalam bentuk mudah dihadam boleh memberi kesan bukan sahaja mampu memberi kesan pada peringkat awal pertumbuhan ayam pedaging tetapi sehingga ke hujung waktu penternakan dan mengeluarkan potensi genetik pertumbuhan ayam. Kajian ini dilaksanakan untuk mengenalpasi kesan diet pra-permulaan dengan suplemen tenaga dan diet dengan makanan lembab kepada berat badan, Kadar Penukaran Makanan (KPM), dan keadaan bangkai (berat organ dan lemak) untuk ayam pedaging. 60 anak ayam pedaging Cobb 500 berumur satu hari telah dipilih secara rawak untuk 4 rawatan dengan 3 replikasi, 5 ayam bagi setiap replikasi, selama 42 hari. Anak ayam tersebut ditenak dalam sangkar. Rawatannya ialah diet pra-permulaan yang diberi kepada anak ayam untuk hari pertama sehingga hari ketujuh; rawatan tersebut ialah rawatan kawalan (diet komersial), diet disuplemen dengan glukosa (diet komersial ditambah 4% glukosa/kg), makanan lembab (diet komersial ditambah 0.3 L air/kg) dan makanan lembab disuplemen dengan glukosa. Makanan lembab disediakan setiap dua hari sekali disertakan dengan agen anti-kulat dan disimpan dalam bekas tertutup. Makanan dan air diberi secara *ad libitum*. Dua ayam dari setiap rawatan dipilih secara rawak untuk disembelih pada hari ke-42 dan keadaan bangkai dicatat. Ayam yang di bawah rawatan kawalan dan rawatan diet

disuplemen dengan glukosa mempunyai KPM terbaik jika dibandingkan dengan ayam diberi makanan lembab. Ayam yang diberi makanan lembab disuplemen dengan glukosa menunjukkan KPM yang lebih bagus ( $P < 0.05$ ) dan mempunyai kadar kenaikan berat badan tertinggi jika dibandingkan dengan rawatan lain, diikuti oleh rawatan kawalan pada minggu keenam. Purata berat lemak abdomen (47.31 g lawan 29.84 g) juga lebih tinggi secara signifikan ( $P < 0.05$ ) untuk ayam diberi makanan lembab disuplemen glukosa. Walaupun begitu, tiada sebarang perbezaan signifikan ( $P > 0.05$ ) untuk berat organ (hati, jantung, usus dan pedal) dan berat lemak di bawah kulit pada setiap rawatan. Ia boleh dirumuskan bahawa diet pra-permulaan makanan lembab dengan penambahan glukosa akan menghasilkan ayam pedaging dengan kenaikan berat badan lebih tinggi dan pengurangan pembentukan lemak visceral pada penghujung tempoh penternakan (6 minggu). Walaupun begitu, untuk analisis morfometrik, diet rawatan kawalan mempunyai vilus tertinggi.

## CHAPTER 1

### INTRODUCTION

The broiler industry is the biggest industry in Malaysia and provides most of the protein source for Malaysian consumption. As stated by the Federation of Livestock Farmer's Associations of Malaysia (2014), "In Malaysia, the livestock industry is dominated by the poultry industry which supplies more than 80 percent of the total meat requirements of the country". Modern commercial strains of broiler chicken can reach average weight of 2 kg on fifth to sixth week of rearing. The fast growing broiler strains have less feed requirement compared to the broiler chicken in early 90's where they only can reach marketable weight on the 16<sup>th</sup> week. This rapid growth has big impact on other costs including reducing cost of labour, heating, and those associated with rearing the flock. Feed cost is the highest cost in the total cost of production of poultry, and makes up to 70% from the total cost. A day reduced in rearing can greatly save money from feeding cost especially if a large number of chicken are reared as in commercial farms. If there is a way we can improve the growth performance of the broiler chicken so that it will reach a marketable weight faster even by a day, it will give a significant impact on cost to the farmer.

All aspects concerning to growth rate starts from the first 24 hours after the chicks have hatched from the eggs. The chicks get their nutrient requirement for survival in the first day of life satisfied from the remaining yolk. The first week after hatch is an extremely important time for all young poultry (Tabeidian *et al.*, 2014). The day old chicks have to go through a major shift of metabolic dependence from endogenous lipid-rich yolk to feed on exogenous carbohydrate and protein-rich feed. Willemsen *et al.* (2010) stated that newly hatched chicks have immature digestive system and their digestive tracts have to undergo major morphological and physiological



changes in the first week of age to allow proper digestion and utilization of ingested nutrients. This means that the pre-starter diet given must be highly digestible and ensure that the chicks get the nutrient and energy needed for early development as well as for subsequent growth and development as broiler chicken. Semi-moist diet may facilitate faster digestion, gut clearance and ultimately encourage higher feed intake.

### **1.1 Objectives**

The effect of pre-starter diet composition with high digestible energy supplement and higher moisture is less known. Therefore, the present study was conducted to investigate the effect of pre-starter diet with energy supplementation and semi-moisture on growth performance of broiler chicken.

The specific objectives of the study were:

- To investigate the effect of pre-starter diet supplemented with highly digestible energy source (monohydrous dextrose) and moisture content on growth performance of broiler chicken.
- To determine the effect of pre-starter diet supplementation with highly digestible energy source and moisture content on carcass characteristics of broiler chicken.

### **1.2 Hypothesis**

Easily digestible high energy pre-starter diet with higher moisture would have positive effect on growth performance in comparison to normal commercial diet. This is due to the easily absorbed energy from simple source such as glucose being able to provide extra energy to promote growth. With higher

moisture in prestarter diet, the feed is expected to become more digestible as the moisture would reduce viscosity, and gut development can take place earlier resulting in better gut morphometric.



## REFERENCES

- Agricultural & Applied Economics Association. (2015). Feed Grains and Livestock: Impacts on Meat Supplies. In D. L. John, M. James, D. A. John, & P. A. David, *Choices*.Vol23,pp20-25. Agricultural & Applied Economics Association.
- Arshad, F. M., Raja Abdullah, N. M., Kaur, B., & Abdullah, A. M. (2007). *50 Years of Malaysian Agriculture- Transformational Issues, Challenges and Directions*. Serdang: University Putra Malaysia Press.
- Brink, M. v., & Rhee, W. v. (2007). Semi-moist diet to improve doc chicks. In W. P. Association, *World Poultry*.Vol 23,pp17-19.
- Choe, H. S., Um, J. S., & Ryu, K. S. (2013). A Comparison of Various Energy and Protein Concentrations in Diets on the Performance, Bone Mineral Density and Blood Characteristics of Broiler Chicks. *Korean Journal of Poultry Science*.Vol40,pp369-377.
- Choo, Y. K., Kwon, H. J., Oh, S. T., Um, J. S., Kim, B. G., Kang, C. W., . . . An, B. K. (2014). Comparison of Growth Performance, Carcass Characteristics and Meat Quality of Korean Local Chickens and Silky Fowl. *Asian-Australasia Journal of Animal Science*.Vol27,pp398-405.
- Cobb-Vantress Incorporation. (2010). Implications for genetic companies. *Alltech Technical Symposium* (pp. 1-9). Arkansas: Cobb-Vantress Incorporation.
- Cobb-Vantress Incorporation. (2015, November 15). *Cobb500 Broiler Performance & Nutrition Supplement*. Retrieved from Cobb-Vantress Web Site: [http://www.cobb-vantress.com/docs/default-source/cobb-500-guides/Cobb500\\_Broiler\\_Performance\\_And\\_Nutrition\\_Supplement.pdf](http://www.cobb-vantress.com/docs/default-source/cobb-500-guides/Cobb500_Broiler_Performance_And_Nutrition_Supplement.pdf)
- De Verdal, H., Mignon-Grasteau, S., Jeulin, C., Le Bihan-duval, E., Leconte, M., & Mallet, S. (2010). Digestive tract measurements and histological adaptation in broiler lines divergently selected for digestive efficiency. *Poultry Sciences*.Vol89,pp1955-1961.
- Druyan, S. (2010). The effects of genetic line (broilers vs. layers) on embryo development. *Poultry Sciences*.Vol89,pp1457–1467.
- Gava, M. S., Moraes, L. B., Carvalho, D., Chitolina, G. Z., Fallavena, L. B., Moraes, H. L., . . . Salle, C. T. (2015). Determining the Best Sectioning Method and Intestinal Segment for Morphometric Analysis in Broilers. *Brazilian Journal of Poultry Sciences*,Vol17,pp145-150.
- Goldspink, G. (1977). The Growth of Muscles. In Growth and Poultry Meat Production. *British Poultry Science*,Vol18,pp13-28.
- Griffin, H. D., & Goddard, C. (1994). Rapidly growing broiler (meat-type) chickens: Their origin and use for comparative studies of the regulation of growth. *International Journal of Biochemistry*,Vol26,pp19-28.

- Havenstein, G. B., Ferket, P. R., & Qureshi M, A. (2005). Carcass Composition and Yield of 1957 Versus 2001 Broilers When Fed Representative 1957 and 2001 Broiler Diets. *Poultry Sciences*, Vol82, pp1509-1518.
- Le Bihan, D. E., Millet, N., & Remignon, H. (1999). Broiler meat quality: Effect of selection for increased carcass quality and estimates of genetic parameters. *Poultry Science*, Vol78, pp822-826.
- Saki, A. A. (2005). Effect of Post-hatch Feeding on Broiler Performance. *International Journal of Poultry Science*, Vol4, pp4-6.
- Scott, T. A. (2002). Impact of wet feeding wheat-based diets with or without enzyme on broiler chick performance. *CANADIAN JOURNAL OF ANIMAL SCIENCE*, Vol82, pp409-417.
- Shafey, T. M., Aljumaah, R. S., Almufarrej, S. I., Al-Abdullatif, A. A., & Abouheif, M. A. (2011). Effect of Glucose Supplementation of Drinking Water on the Performance of Fasting Newly Hatched Chicks. *Journal of Animal and Veterinary Advances*, Vol10, pp2202-2207.
- Shivazad, M., Bejaei, M., Taherkhani, R., Zaghari, M., & Kiaei, M. M. (2007). Effect of Glucose Injection and Feeding Oasis on Broiler Chick's Subsequent Performance. *Pakistan Journal of Biological Sciences*, Vol10, pp1860-1864.
- Siegel, B. P. (2009). The poultry scientist: Past, present, and future1. *Poultry Science*, Vol88, pp1133-1136.
- Tabeidian, S. A., Toghyani, M., Toghyani, A. H., Barekatin, M. R., & Toghyani, M. (2015). Effect of Pre-starter Diet Ingredients and Moisture Content on performance, Yolk Sac Utilization and Small Intestine Morphology in Broiler Chickens. *Journal of Applied Animal Research*, Vol43, pp157-165.
- Ullah, M. S., Pasha, T. N., Ali, Z., Saimah, Khattak, F. M., & Hayat, Z. (2012). Effect of Different Pre-starter Diets on Broiler Performance, Gastrointestinal Tract and Carcass Yield. *The Journal of Animal and Plant Sciences*, Vol22, pp570-575.
- Willemsen, H., Debonne, M., Swennen, Q., Everaert, N., Careghi, C., Han, H., . . . Decuyper, E. (2010). Delay in Feed Access and Spread of Hatch: Importance of Early Nutrition. *World's Poultry Science Journal*, Vol66, pp177-188.
- Yamauchi, K. E., Inchraoen, T., & Yamauchi, K. (2010). The Relationship Between Intestinal Histology and Function as Shown by Compensatory Enlargement of Remnant Villi After Midgut Resection in Chickens. *The Anatomical Record*, Vol293, pp2071-2079.
- Zuidhof, M. J., Schneider, B. L., Carney, V. L., Korver D, R., & Robinson F, E. (2014). Growth, efficiency, and yield of commercial broilers from 1957, 1978, and 2005. *Poultry Sciences*, Vol93, pp1-13.