FORMULATION OF CHICKS FEED BASED ON PALM KERNEL CAKE (PKC)

FOONG KAH KAH

A thesis submitted in fulfillment of the
requirements for the award of the Bachelor degree
of Chemical and Nature Resources Engineering

Faculty of Chemical and Nature Resources Engineering
University Malaysia Pahang

APRIL 2008

"I declare that this thesis entitled "Formulations of chicks feed based on palm kernel cake (PKC) is the result of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree."

Signature : …….
Name : Foong Kah Kah
Date : …….

To my beloved parents, sisters and brother.

ACKNOWLEDGEMENT

This study would not be complete without the assistances and support who guided and advised me in the course of my degree project. First and foremost I praised to God, with His wisdom guiding me to complete my study.

I like to express my thankfulness to my supervisor honorable supervisor, Tuan Haji Mat Noor. Without his encouragement, academic guideline during my study, I will not able to complete my study. His working attitude, dedication is the good examples for me to follow.

Lastly, I would like to thank my parents and family members, who support, cares and encouraged me all the time.

ABSTRACT

Poultry feed requirement increased rapidly due to growing populations in our nation. Thus it is critical to find out some alternatives ways to overcome the problems. Study was carried out in UMP to test the effects of chicks on different ratio of Palm Kernel Cake (PKC) based feed. Palm kernel cake identified as substitute protein for cattle feed and it is very potential use in poultry industry. However, the lacked of digestible protein might lead the limitations of it in poultry feed. The activities carried on included analysis of feed ingredients (PKC), to analyze final designed feed for chicks and evaluate the effects on chicks. Developed feed with sufficient of nutrients requirements and suitable PKC ratio are the big challenge to deal with in this study. The evaluations on chicks are to observe the effects of feeds on chicks. The study took 3 weeks to evaluate based on two type feed, feed A with 15% PKC and feed B with 20% PKC. From the analysis, the nutrition composition for both designed feed are fulfilled the standard requirements for poultry feed. From the observation and result, it shows that the performance of group A which is 906.3 g better than group B 899.2g in the end of research. Both feed are suitable to used as chicks feed, however based on economy factor, feed B is suitable for commercialize. The average food consumption for feed A is 62.06 g/day and feed B is 63.43 g/day. There are not significant relationship between food consumption and weight gain. This is because group B consumed more feed but their weight gain is lower. The feed / weight gain ratio for feed A is 1.4832 whereas feed B is 1.4814.

ABSTRAK

Permintaan makanan haiwan ternakan semakin meningkat atas peningkatan populasi negara kita. Jadi, masa semakin singkat untuk mencari jalan penyelesaianya. Peagajian ini dijalankan di UMP untuk menguji kesan ayam terhadap makanan yang disediakan dengan pelbagai nisbah PKC. Palm kernel cake dikenali sebagai peganti protein untuk makanan lembu dan ia berpotensi digunakan dalam sektor makanan untuk ayam. Walaubagaimanapun kekurangan protein yang dapat dicernakan mungkin menghadkan pengguanan PKC dalam sektor makanan untuk ayam. Aktiviti dijalankan termasuk pengajian terhadap PKC, pengajian terhadap makanan yang direkakan, dan menyelidik kesan terhadap ayam. Menyediakan makanan ayam dengan kandungan nutrisi yang mencukupi dan menentukan nisbah PKC sesuai digunakan adalah cabaran yang perlu diatasi bagi pengajian ini. Penyelidikan terhadap ayam bertujuan untuk mendapat kesan ayam terhadap makanan. Pengajian ini mengambil masa sebanyak tiga minggu dan dua jenis makanan disediakan, iaitu sajian A dengan 15% PKC dan sajian B dengan 20% PKC. Dengan penyelidikan dijalankan, kedua-dua sajian memenuhi permintaan nutrisi yang ditetapkan dalam makanan ayam. Daripada pemerhatian dan keputusan yang diperolehi, keputusan kumpulan A dengan berat 906.3 g lebih baik daripada kumpulan B dengan berat 899.2 g pada akhir penyelidikan. Kedua-dua sajian sesuai digunakan sebagai makanan ayam, tetapi daripada ekonomi aspek, sajian B lebih sesuai untuk komersil. Purata sajian dihabiskan untuk sajian A ialah 62.06 g / hari, dan sajian B ialan 63.43 g / hari. Hubungan antara sajian dihabiskan dengan berat badan ayam tidak jelas. Ini disebabkan kumpulan B menghabiskan lebih banyak sajian namun berat badan mereka lebih rendan dibandingkan dengan kumpulan A. Nisbah untuk makanan dihabiskan / berat badn dicapai untuk kumpulan A ialah 1.4832 dan kumpulan B ialah 1.4814.

TABLE OF CONTENTS

CHAPTER	TITTLE	PAGE
1	**INTRODUCTION**	
1.1	Background of Study	1-3
1.2	Problem Statement	3-4
1.3	Objectives of Study	4-5
1.4	Scope of Study	5
2	**LITERATURE REVIEW**	
2.1	Overview	6
2.2	Type of Chicken	6
2.3	Component of Poultry Feed	7
	2.3.1 Energy	7
	2.3.2 Carbohydrate	7-8
	2.3.3 Protein	8-9
	2.3.4 Fats	9-10
2.3.5	Minerals	10-11
2.3.6	Vitamins	11-12
2.4	Water	13-14
2.5	Palm Kernel Cake	14-17
2.6	Nutrition of Raw Materials	17-18

2.6.1 Soya de-Oiled cake 18
2.6.2 Fish 19
2.6.3 Maize 19
2.7 Amino Acid Digestibility 20
2.8 Suitable Living Condition for chicks 20-21
2.9 Near-infrared Analyzer (NIR) 22-23

3 METHODOLOGY

3.1 Introduction 24
3.2 Type of chicks 25
3.3 Collection of PKC 25-26
3.4 Designing and grinding the designed feed 26-28
3.5 Method to analysis the final design feed stuffs 27-29
3.6 Evaluates the chicks feedings trails 30-31

4 RESULT AND DISCUSSION

4.1 Introduction 32
4.2 Nutrients Composition of Raw materials 32-34
4.3 Nutrition Composition of designed feed 35
4.4 Weight gain and food consumption for chicks 36-41

5 CONCLUSION

5.1 Conclusion 42-43
5.2 Recommendations 43-44

References 45-47
Appendices 48-53

LIST OF TABLES

TABLE NO.	TITLE	PAGE
2.1	Common Percentage if Nutrients Found in Poultry Rations	11
2.2	Water composition by chickens of different age	14
2.3	Nutrients Composition of PKC solvent extracted and expeller pressed techniques	15
2.4	General physical and Chemical properties of Soya de-oiled cake	16
2.5	Chemical and composition and nutrients of maize	17
3.1	Percentage of poultry feed based on variety ratio of PKC	26
3.2	Weight of poultry feed based on variety ratio PKC	27
4.1	Percentage of Nutrients	33

	Composition of PKC	
4.2	Percentage of Nutrients composition of soya , maize	33
4.3	Nutrition composition and method analysis of fishmeal	34
4.4	Nutrition composition of Feed A and B	35
4.5	Average weight gain and food consumption for chicks	36

LIST OF FIGURES

TABLE NO.	TITLE	PAGE
3.1	Grade A baby chicks aged 1 days	25
3.2	Factory of Felda Kernel Products Sdn Bhd	26
3.3	Sample of Palm Kernel Cake	26
3.4	Grinder Type FFC 23	28
3.5	Sample of feed A	28
3.6	Sample of feed B	29
3.7	Near Infrared Red (NIR)	30
3.8	Living ares for chicks	31
4.1	Average weight gain versus time for feed A	37
4.2	Average weight gain versus time for feed	37

4.3	Comparisons AWG with feed A and feed B	38
4.4	Average food consumption gain versus time for feed A	39
4.5	Average food consumption gain versus time for feed B	39
4.6	Comparisons AFC with feed A and feed B	40

LIST OF APPENDICES

APPENDICES	TITLE	PAGE
1	Grantt Chart For Undergraduat Research Project 1	48
2	Grantt Chart For Undergraduate Research Project 2	49
3	Nutrition Composition of PKC	50
4	Nutrition Composition of Maize and Soybean	51
5	Nutrition Composition of fishmeal	52
6	Nutrition Composition of designed feeds	53

CHAPTER 1

INTRODUCTION

1.1 Background of Study

The oil palm (*Elaeis guineensis* Jacq) is a native of the humid tropics of West Africa. It has since been planted successfully in tropical regions within 20 degrees of the equator.The oil palm sector is one of the major industries in Malaysia since the 1970s. About half of the world palm oil production (10.8 million tonnes) was accounted for by Malaysia. (Yusof Basiron, 2000)

Today almost half of Malaysia's cultivated land consists of oil palm, and the country has become the world's largest producer and exporter of palm oil. Malaysian exports to that country alone are expected to grow more than 20 percent from 2.9 million metric tons in 2005 to more than 3.5 million metric tons in 2006, representing almost 1 percent of the value of Malaysia's total exports. (Butler, 2006)

With palm oil prices up nearly 68 percent since January, 2006, plantations now cover about 4 million hectares in Malaysia. Based on current trends; the oil palm industry is set to continue to grow to satisfy global demand. (Najib Razak, 2007)

Palm oil is an excellent product and useful product. However, residues from oil palm have not been used effectively. Until recently, the remaining 90% (empty fruit bunches, fibers, fronds, trunks, kernels, palm oil mill effluent) was discarded as waste,

and either burned in the open air or left to settle in waste ponds. Although this way, the palm oil processing industry's waste contributed significantly to CO_2 and methane emissions. (Jessada, 2007).

The palm oil industry is now at the stage of seeking more value-added products not only from the oil and kernel but also its biomass. In the case of biomass, there is ample opportunity to convert the 13.2 million tonnes (dry weight) of biomass per year available in the oil palm sector into pulp and paper, particleboard, medium density fibre board, furniture etc. (Kamaruddin et al., 1997).

According to a research the estimated 10% per annum growth in demand for animal products in Malaysia up to 2025 makes it critical to develop and utilize whatever feed resources that are available. (Mohd Khusahry *et al.,* 2003).

As noted in the NAP3, globalization and liberalization will open new opportunities for export of livestock production and facilitate competitive sourcing of raw materials. The country has the capability to specialize and be competitive in the production of certain livestock products, especially the poultry sub-sector. The sub-sector is expected to integrate and consolidate further to become more efficient and more productive in order to capitalize on the export market. (Chiew, 2001).

To strengthen competitiveness and institutional support, the NAP3 suggests that the installation of effluent treatment system will be encouraged through the abolition of import tax for specialized on-farm treatment equipment, and suitable incentives for investment in automation will be provided and import tax on all specialized livestock farm and processing equipment will be abolished. In the area of strategic sourcing, it encourages oversea investments in meat and feed production (Chiew, 2001).

In Malaysia, most of raw materials ingredients are not produced locally. Particularly poultry are dependent on imported feedstuffs such as soybean meal, corn gluten meal, fish meal and meat and bone meal, mineral sources and various micro-ingredients: vitamins, minerals and other additives used to improve feed efficiency and growth. Although some of the raw materials such as tapioca and fishmeal are produced locally. However, the amount is not sufficient to meet the requirements of the local feed industry. (Raghavan,2000).

Malaysia Agricultural Research and Development Institute (Mardi) senior research officer Dr Jaafar Daud expressed optimism on the prospects of oil palm kernel cake replacing a certain amount of corn and soybean which are now the major ingredients for making poultry feed. The poultry industry can expect lower cost for chicken feed and better margins, as local researchers have discovered that palm kernel cake can be used as part of feed formula. (Chong Jin Hun, 2004).

The studies is concentrated of production of poultry feed from the palm kernel cake were done to expand the usage of palm oil trees and to met the higher demand in poultry feed.

1.2 Problem Statement

The populations of Malaysians are increasing under the policy of government. Hence, the requirements of livestock are increasing in a rapid rate. The majority of feedstuffs used in rations of poultry are imported. Maize and soybean meal are the major imported ingredients. Locally available raw materials contribute about 30% of the total feed ingredients in Malaysia.

Availability of amino acid profiles of locally feed ingredients has not been fully determined. In normal practice, if any local ingredients are used; extra amino acids must be supplied or by adding other more protein rich ingredients for maximum performance. (Raghavan, 2000)

Furthermore, the local fishmeal production depends on the supply of fish waste and the fish industry is not huge enough to support fishmeal production as well as for human consumption. These may cause the supply irregular. As a consequence, the local feed millers prefer to import the fishmeal than using the local produced fishmeal. Soybean meal is produced in small quantities and is obtained after extraction of oil from soybean, the production of soybean curd and soybean drinks. (Raghavan, 2000)

Moreover, the price of the imported feed ingredients is often subjected to price instability. It further added that alternative formulation of feed using locally available raw materials is not well developed.

It has been suggested by growing the major feedstuffs or fully utilize the agricultural wastes may solve the problem of importation bill. Chiew claimed that PKC is potential replace parts of protein part amount of corn and soy bean for making the chicks feed. The PKC is potential as a protein substitute in poultry feed. The ratio of PKC possible use in poultry feed is up to 30%. (Mohd Hafiz,2008). The availability of PKC used in poultry feed provide an alternatives for poultry feed, reduce the reliable on imported feedstuffs and hence lower the price of chickens. Rather than that, it was expected to decrease the cash flow to foreign country especially United States.

1.3 Objectives

The objectives of this research listed as below

1) To study the right nutrition composition of PKC based feed for chicks
2) To justify the possibility of PKC used as protein substitute in chicks feed.

1.4 Scopes Of Study

The scopes of the study are:

1) Analysis of feed ingredients (PKC)
2) Analyze final designed feed for chicks
3) Evaluate the effects on chicks.

CHAPTER 2

LITERATURE REVIEW

2.1 Overview

The Malaysian livestock industry is an important and integral component of the agricultural sector providing gainful employment and producing useful animal protein food to the population. (NAP, 1998). Under the government policy, a great achievement was shown in the field of poultry food production. By development of technology, variety methods were introduced and facilitate souring of raw materials. Suitability of PKC as feed for poultry has been much proven. This study will focus on poultry feed for broilers.

2.2 Type of Chicken

Study is specialized and in an attempt on production of chicken feed for meat type broilers. In Malaysia, meat type chicken is the most common type commercialized usage. Although different strains of chicken were reported in each of these publications, the standard for meat-type chicken production was moving towards an increased growth rate. In 1977, broiler chickens would be expected to reach 2 kg in 4 weeks (NRC, 1977).

2.3 Component of Poultry Feed

Chicken feed use feed for two main purposes. As energy source to maintain body temperature and to carry on activities such as breathing, walking, eating and digesting the feed. Secondly, as building material for the development of bone, flesh, feathers and eggs. The feed that chickens eat is made up of water, carbohydrates, fats, proteins, minerals and vitamins. Each nutrient serves a special need. (Larry and Nick, 2002). Basically, poultry are mixtures from cereal grains, soybean meal, animal by-product meals, minerals, fat and vitamin. The feedstuff is essential for effective broilers growth and reproduction.

2.3.1 Energy

Energy is not a nutrient but a property of energy-yielding nutrients when they are oxidized during metabolism. The energy value of a feed ingredient or of a diet can be expressed in several ways. Thus, a description is presented below of terminology associated with dietary energy values, including units of measure (digestible energy, metabolizable energy, etc. (National Research council, 1994).

2.3.2 Carbohydrates

Dietary carbohydrates are important sources of energy for poultry. Cereal grains such as corn, grain sorghum, wheat, and barley contribute most of the carbohydrates to poultry diets. The majority of the carbohydrates of cereal grains occur as starch, which is readily digested by poultry (Moran, 1985).Cellulose and other complex carbohydrates cannot be used efficiently and are classified as crude fiber. (Larry and Nick, 2002).

Supplementation of rye or barley-containing diets with appropriate supplemental enzyme preparations improves nutrient utilization and growth of young poultry (Leong et al., 1962; Edney et al., 1989; Friesen et al., 1992).

2.3.3 Protein

Protein are mainly constitutes the productive state of bird. Proteins are complex compound made up of amino acids. Amino acids formed by broken down of protein. Amino acids meet the requirement of diversity functions. They are absorbed and transported by the blood to the cells that assemble these amino acids into body protein.

Amino acids, as proteins, are primary constituents of structural and protective tissues, such as skin, feathers, bone matrix, and ligaments, as well as of the soft tissues, including organs and muscles. Because body proteins are in a dynamic state, with synthesis and degradation occurring continuously, an adequate intake of dietary amino acids is required. If dietary protein (amino acids) is inadequate, there is a reduction or cessation of growth or productivity and a withdrawal of protein from less vital body tissues to maintain the functions of more vital tissues. (National Research council, 1994)

When diets are formulated from natural ingredients containing conventional amounts of fat, chick growth is maximized with a concentration of 20%-24% protein and this value form the recommendation of the Mardi. (Mardi, 2004). Protein quality is based on the presence of essential amino acids in the feed ingredients. In developing a poultry ration, the nutritionist will include a variety of feedstuffs that are high in protein. The reason for this is that no single feedstuff is able to provide all the amino acids needed. When the proteins from different feedstuffs are used, however, the ration can be formulated to contain all the necessary amino acids. The main sources of protein in

poultry rations are animal proteins such as fish meal, meat and bone meal, and plant proteins such as soybean meal, cottonseed meal and corn gluten meal.

2.3.4 Fats

Fat is usually added to the feed for meat-type poultry to increase overall energy concentration and, in turn, improve productivity and feed efficiency. Supplemental fats may increase energy use in adult birds in association with a decreased rate of food passage through the digestive tract. . (Vest and Dale, 2002)

Feed-grade fat may come from many different sources. Grease from restaurants, the rendering of animal carcasses, and the refuse from vegetable oil refining are major sources. These sources represent several types and categories, and each is defined by the (Association of American Feed Control Officials, 1984).

Total fatty acids contributed by all lipid categories, the proportion that are in free form, and the types of fatty acids present provide information related to expected digestibility as well as how the fat may be used subsequently. Fatty acid chain length, extent of unsaturation, and nature of esterification all influence intestinal absorption (Moran, 1989). The linoleic acid requirement has been estimated as 1.0 percent of the diet (Balnave, 1970).

Linoleic acid is the only essential fatty acid for which a dietary requirement has been demonstrated. Inadequacies of linoleic acid are not readily encountered, but symptoms that result are due to a loss of membrane integrity. Increased needs for water and decreased resistance to disease are characteristic deficiency symptoms observed in poultry (Balnave, 1970).

A deficiency of linoleic acid in the male can impair spermatogenesis and affect fertility. Insufficient deposition of linoleic acid in the egg will adversely affect embryonic development. The essential fatty acid requirements of growing and adult birds can usually be satisfied by feeding a diet with 1 percent of linoleic acid. Higher levels of linoleic acid may be needed by the laying hen to achieve and maintain satisfactory egg weight.

2.3.5 Minerals

The mineral portion of the feed is inorganic matter. Minerals are required for the formation of the skeleton, as components of various compounds with particular functions within the body, as cofactors of enzymes, and for the maintenance of osmotic balance within the body of the bird. They are often divided into two categories, based on the amount that is required in the diet. Requirements for major, or macro, minerals usually are stated as a percentage of the diet, whereas requirements for minor, or trace, minerals are stated as milligrams per kilogram of diet or as parts per million.

Research found that calcium and phosphorus requirements of the broiler are in concerned and minimal research concerning requirements for trace elements. The precise requirements for minerals such as potassium, magnesium, and iron in practical diets are not well defined because practical diets are usually adequate or only slightly deficient in these minerals.

Calcium, phosphorus and salt are needed in the greatest amounts. Calcium and phosphorus help build bones and make them strong and rigid. Most of the calcium in the diet of the growing bird is used for bone formation. Other functions of calcium include roles in blood clotting and as a second messenger in intracellular communications. If a calcium source contains a high level of magnesium (as does dolomitic limestone), it probably should not be used in poultry diets (Stillmak and Sunde, 1971).

The requirements for minerals such as iron, manganese, and zinc are much lower for chicks fed semipurified diets containing little or no phytate and fiber than for those fed practical diets, mainly because of relatively poor bioavailability of some minerals in practical ingredients (Kratzer and Vohra, 1986). For example, the bioavailability of zinc in zinc sulfate is much higher than in zinc oxide (Wedekind and Baker, 1990). Consequently, the reported requirement for a mineral may vary among studies owing to differences in the bioavailability of the supplemental mineral source and the use of ingredients that interfere with utilization of the mineral under study.

Bone meal and defluorinated and dicalcium phosphates supply additional calcium and phosphorus. Ground limestone and oyster shell are good calcium sources. Trace levels of iodine, iron, manganese and zinc are also included in mineral supplements.

2.3.6 Vitamins

Vitamins occur in feeds in small amounts, but they are absolutely necessary for growth, reproduction and the maintenance of health. They occur in feedstuffs in varying quantities and in different combinations.

Vitamins are generally classified under two headings: fat soluble vitamins, A, D, E, and K, and water-soluble vitamins that include the so-called B-complex and vitamin C (ascorbic acid). Vitamin C is synthesized by poultry and is, accordingly, not considered a required dietary nutrient. There is some evidence, nevertheless, of a favorable response to vitamin C by birds under stress (Pardue et al., 1985). Some vitamins are produced by microorganisms of the intestinal tract. Vitamin D can be produced by sunlight on the bird’s skin.