



**UNIVERSITI PUTRA MALAYSIA**

**THE INFLUENCE OF PALM KERNEL CAKE ON SMALL INTESTINE AND  
CECA MICROFLORA POPULATION OF CHERRY VALLEY DUCK**

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FACULTY OF AGRICULTURE  
UNIVERSITI PUTRA MALAYSIA

2014/2015

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BY

NOOR AMIRAH BINTI MOHD NOR

A project report submitted to Faculty of Agriculture, Universiti Putra Malaysia, in fulfillment of the requirement of SHW4999 (Final Year Project) for the award of the degree of Bachelor of Agriculture (Animal Science)

Faculty of Agriculture

Universiti Putra Malaysia

2014/2015

## CERTIFICATION

This project report entitled **THE INFLUENCE OF PALM KERNEL CAKE ON SMALL INTESTINE AND CECA MICROFLORA POPULATION OF CHERRY VALLEY DUCK** is prepared by Noor Amirah binti Mohd Nor and submitted to Faculty of Agriculture in fulfillment of the requirement of SHW4999 Final Year Project for the award of the degree of Bachelor of Agriculture (Animal Science).

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**ABSTRAK**

Hampas kelapa sawit (PKC) adalah produk sampingan daripada penanaman pokok kelapa sawit (*Elaeis guineensis* Jacq.). Indonesia dan Malaysia menghasilkan kira-kira 85% daripada minyak sawit dunia. Di Malaysia, ladang kelapa sawit membentuk 77% daripada tanah pertanian atau kira-kira 15% daripada jumlah kawasan tanah. Pada 2013, Malaysia telah menghasilkan 2 516 664 tan metrik PKC. Disebabkan PKC telah dihasilkan dalam jumlah yang banyak dan konsisten serta boleh didapati dengan harga yang berpatutan merupakan antara faktor untuk menggunakan hasil sampingan pertanian ini untuk menggantikan sebahagian makanan komersial ternakan terutamanya dalam industri ternakan. Walau bagaimanapun, dalam industri ayam, penggunaan PKC sebagai makanan haiwan agak terhad kerana tahap serat yang tinggi dalam PKC dan kadar penghadaman yang rendah. Satu kajian telah dijalankan untuk mengkaji kesan daripada suplemen PKC pada populasi bakteria usus kecil dan ketinggian villi di dalam itik Cherry Valley. Tiga puluh enam itik jantan Cherry Valley berusia empat hari diletakkan secara rawak ke dalam 9 sangkar berdasarkan persampelan rawak mudah. Tiga rawatan pemakanan telah digunakan dengan tiga replika setiap rawatan dan empat itik setiap replika untuk Rawatan 1 (T1), Rawatan 2 (T2) dan Rawatan 3 (T3). Rawatan 1 telah digunakan sebagai pengawal dan menerima diet asas manakala untuk T2 dan T3 telah diberikan dengan diet asas dengan kemasukan 15% PKC dan 35% masing-masing. Itik dibela selama dua bulan sebelum disembelih untuk pengambilan sampel. Terdapat perbezaan yang signifikan ( $P < 0.05$ ) bagi jumlah populasi bakteria di T2 apabila dibandingkan dengan T1. Tambahan 35% PKC dalam T3 menunjukkan peningkatan dengan ketara pada koloni *Lactobacilli* sp. berbanding T1. Bilangan populasi *Escherichia coli* pada T2 dan T3 berkurangan berbanding T1. Walau bagaimanapun, hanya T2 menunjukkan pengurangan ketara dalam koloni *Escherichia coli* yang terbentuk. Bilangan Coliform telah berkurangan di T2 dan T3

berbanding T1. Untuk ketinggian villus dan kedalaman krip ileum, kajian menunjukkan bahawa tidak terdapat perbezaan yang signifikan ( $P > 0.05$ ) bagi Rawatan 2 dan 3 Rawatan berbanding Rawatan 1. Dari kajian ini, dapat disimpulkan bahawa peningkatan kandungan serat mungkin dijangka akan meningkatkan jumlah nombor bakteria dan mengubah populasi mikroflora dalam saluran usus. Walau bagaimanapun, tahap PKC yang berbeza dalam diet tidak menjejaskan ketinggian vili dan kedalaman krip pada ileum.



## ABSTRACT

Palm kernel cake (PKC) is a by-product of the cultivation of oil palm trees (*Elaeisguineensis Jacq.*). Approximately, 85% of the world's palm oil are produced by Indonesia and Malaysia. In Malaysia,

oil palm plantations make up 77% of agricultural land or about 15% of total land area. During 2013, Malaysia have been produced 2 516 664 tonnes of PKC. Large amount of PKC been produced and consistently available with reasonable price are the reasons to use this agricultural by-product to partially substitute the commercial animal feed especially in poultry industry. However, in poultry industry, the used of PKC as animal feed is rather limited because of high level of fibre in the PKC and low digestibility of palm kernel cake. A study was conducted to investigate the effects of PKC supplementation on small intestinal bacterial population and villi height in Cherry Valley duck. Thirty six four-days-old Cherry Valley male ducks were randomly assigned into 9 cages based on simple random sampling. Three dietary treatments were used with three replicate per treatment and four ducks per replicates for Treatment 1 (T1), Treatment 2 (T2) and Treatment 3 (T3). Treatment 1 was kept as control and received basal diet while T2 and T3 were treated with basal diet with inclusion of 15% PKC and 35% PKC respectively. The ducks were raised for two months before slaughter for sample collection. There were significant different ( $P < 0.05$ ) for total bacteria population in T2 when compare to T1. Supplementation of 35% PKC in T3 result in significantly increased of *Lactobacilli* sp. colony as compared to T1. The number of *Escherichia coli* formed in T2 and T3 were reduced as compared to T1. However, only T2 show significant reduction in *Escherichia coli* colony formed. The number of *Coliform* were significantly reduced in T2 and T3 as compared to T1. For the villus height and crypt depth of ileum, the study shows that there are no significant different ( $P > 0.05$ ) for Treatment 2 and Treatment 3 as compared to Treatment 1. From this study, it can be concluded that increased dietary fibre content might be expected to increase the total numbers of bacteria and alter the makeup of the microflora in the intestinal tract. However, different level of PKC inclusion in diet do not affect the villus height and crypt depth of the ileum.

## CHAPTER 1

### INTRODUCTION

There are three main categories of the feed resources which are forages, crop residues and agro-industrial by-products (ABP). Forages can be defined as all plant materials palatable to the livestock including grasses, legumes and shrubby plant while crop residues are mainly fibrous materials, by-products of crop cultivation such as rice straw. ABP are by-products derived from processing of the main crop or animal products. ABP usually less fibrous and generally have higher nutrient content such as palm kernel cake (PKC).

PKC is a by-product of the cultivation of oil palm trees (*Elaeisguineensis Jacq.*). 85% of the world's palm oil are produced by Indonesia and Malaysia. In Malaysia, oil palm plantations make up 77% of agricultural land or about 15% of total land area. During 2013, Malaysia have been produced 2 516 664 tonnes of PKC. Large amount of PKC been produced and consistently available with reasonable price are the reasons to use this agricultural by-product to partially substitute the commercial animal feed especially in poultry industry.

PKC contain 89%-93% dry matter, 14.6%-16.0% crude protein, 12.1%-16.8% crude fibre, 0.2%-1.25% calcium, 0.32%-0.54% phosphorus, 0.16 % magnesium and 18-34 mg/kg copper.

PKC is a good source of energy and protein, it can be used for ruminants without much problems except sheep which can suffer from copper toxicity. For poultry, PKC can be used up to 25%. The high fibre of PKC will cause reduce in feed intake of poultry.

Since animal feed cost contribute 70% of the production cost, it is crucial to find other cheaper alternative to substitute the commercial feed and hence, reduce the production cost. PKC have been used as alternative feed in ruminant industry especially in goats and cattle. However, in poultry industry, the used of PKC as animal feed is rather limited because of high level of fibre in the PKC and low digestibility of palm kernel cake. In addition, PKC is categorized as non-conventional feed resources where PKC are not normally used in commercially produced rations for animals. More information is required on chemical compositions, nutritive value, toxic factors and value in feeding systems. Therefore, feed formulation and proximate analysis are important to do in this experiment.

Although the general opinion of poultry producers and feed manufacturers is that the fibre content of the rations should be kept below 7%, production does not appear to be influenced much by some increase to 8-10% (Esmail, 2012). Studies shows that there were no adverse effects of such a level of fibre from any source on chicken growth, mortality and feed consumption of broiler. With layers, there was no effect on egg production but the efficiency of feed utilisation was reduced, particularly with fibre sources.

*Lactobacillus* and *Bifidobacteria* species utilized dietary fibre and consequently will lead to production of lactic acid and short chain fatty acids. Normal microorganism population can be maintain due to a low pH, thus preventing the establishment of *Salmonella* and other pathogens in the gastrointestinal tract. On the other hand, the slow rate of passage of fibre feeds through the gastrointestinal tract should allow for better digestion of feed and microbial fermentation and hence limit food borne pathogen colonization through the action of the fermentation products.

It is generally accepted that fibres may improve intestinal digestion by reducing the number of goblet cells present on the villous structures in the small intestines, and hence the amount of

goblet mucin which acts as a luminal barrier against absorption are reduced. This, however, may not always be the case, especially with fibre sources of high molecular weight or those having high methoxyl contents.

Excess feeding of such fibre sources may lead to enlargement of the intestinal villi arising from physical stimulation of villous growth similar to that observed with ruminants fed on high fibre diets, where rumen papillae are also enlarged through the physical action of fibres. The increased size of the villi is often coupled with about two-fold increase in goblet cell numbers which adversely affects absorption.

The excessive use of such fibre sources in the diet may also increase viscosity of the intestinal content, with a resulting decrease in bioavailability of vitamin A and utilisation of dietary fats, which adversely affects body weight gain and carcass quality. It is, therefore, recommended to use such sources of fibre in limited amounts when better performance is to be achieved.

### 1.1 RESEARCH HYPOTHESIS

The supplementation of PKC in Cherry Valley duck will increase non-pathogenic bacteria population in duck intestine.

### 1.2 GENERAL OBJECTIVE



The general objective of this research is to study the effect of PKC supplementation on small intestine and ceca microflora population in Cherry Valley duck.

### 1.3 SPECIFIC OBJECTIVE

The specific objectives for this research are:

1. To determine the viable counts of bacteria in digesta of Cherry Valley duck fed with PKC.
2. To measure the villus height and crypt depth of ileum of Cherry Valley duck supplemented with PKC.

### 1.4 SIGNIFICANCE OF STUDY

PKC are being used to reduce the production cost in duck production since 70% of production cost of livestock are feeding cost. Therefore, the purpose of research is to determine effect of PKC supplementation on small intestine and caecal bacterial of the Cherry Valley duck fed with different percentage of PKC. The PKC can be used as alternative feed to the duck if the consumption of PKC did not give significant effect to the intestinal microflora of the duck.

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