JWPR
Journal of World's Poultry Research

© 2016, Scienceline Publication
J. World Poult. Res. 6(1): 01-05, March 25, 2016
Research Paper
PII: S2322455X1500001-5

Effects of Feeding Dietary Palm Kernel Cake on Egg Production and Egg Quality of Khaki Campbell Duck

Anjas Asmara Samsudin[1,2*], Nickcarlstann Hendry[1], Khin Thida Khaing[1]
[1]*Department of Animal Science, Faculty of Agriculture, Universiti Putra Malaysia, 43400 UPM, Serdang, Selangor*
[2]*Institute of Tropical Agriculture, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia*
*Corresponding author's Email: anjas@upm.edu.my

Received: 03 Nov. 2015
Accepted: 12 Jan. 2016

ABSTRACT

The study examined the effects of graded levels of Palm Kernel Cake (PKC) on the laying performance and egg quality in Khaki Campbell ducks. Twenty-seven female Khaki Campbell ducks were randomly assigned to three dietary treatments viz T1 (0% PKC; control), T2 (15% PKC) and T3 (35% PKC) and the performance characteristics and egg quality traits were examined for 4 weeks. Ducks fed T2 and T3 had higher ($P<0.05$) intake than the T1 birds. Nonetheless, diet had no effect ($P>0.05$) on the feed conversion ratio in ducks. Similarly, dietary PKC did not affect ($P>0.05$) the weekly egg production and the percentage of hen-day production. Ducks fed T2 and T3 had greater ($P<0.05$) egg weight compared with T1. The egg haugh unit, shell thickness and yolk color were not affected ($P>0.05$) by dietary PKC. Results indicated that Khaki Campbell ducks could tolerate up to 35% PKC in their diets without detrimental effects on egg production and egg quality.

Key words: Palm Kernel cake**,** Intake, Egg quality, Egg production

INTRODUCTION

Egg is a good source of high quality proteins, vitamins and minerals, hence it is one of the important components of a healthy human diet (ENC, 2012). In addition, eggs are inexpensive and easy to prepare compared with other sources of animal protein (ENC, 2012). Global egg production has increased dramatically over the last 20 years with Asia taking the lead (FAO, 2014). In order to meet the incessant demand for a cheap source of high quality animal protein such as egg, production cost must be reduced to the bare minimum. It has been accentuated that feed accounts for about 70% of the total cost of production of livestock (Zanu et al., 2012). The competition between human and livestock for conventional feedstuffs has led to the scarcity and increased in the price of these feedstuffs (Afolabi et al., 2012). In order to maintain productivity at a lower cost, it is thus imperative to incorporate cheaper and readily available alternative feedstuffs in livestock diets.

Malaysia is the world’s largest producer of palm oil with more than 5 million hactares of land devoted to oil palm plantation. Palm Kernel Cake (PKC) is an important by-product of the palm oil industry and is obtained after the extraction of palm kernel oil from the kernels of the oil palm fruits (Alimon, 2004). PKC is classified as energy feed stuff and its chemical composition is somewhat similar to copra meal, rice bran or corn gluten feed (Yoeng et al., 1981). Thus, PKC has been used to spare conventional feed ingredients such as maize, rice bran and soybeans in animal diets due to its consistent availability and competitive price (Onuh et al., 2010). In Malaysia, the price of PKC was Malaysian Ringgit MYR650 per tonne whereas the price of corn and wheat is MYR1080 and MYR2230 per tonne respectively (DVS, 2013). PKC is widely used as a moderate source of protein and energy in different livestock such as swine (Adesehinwa, 2007), rabbit (Orunmuyi et al., 2006), laying hens (Afolabi et al., 2012 and Chong et al., 2008) and broiler chickens (Sharmila et al., 2014). In poultry, the level of PKC supplementation is varies. For instance, Yeong et al. (1981) suggested that the optimum inclusion rate of PKC is 15% for broiler chickens and higher levels diminished the growth performance and efficiency. However, Onuh et al. (2010) reported a significant reduction in the body weight and feed intake of finisher broiler chickens only when the inclusion rate of PKC exceeds 30%. Given the discrepancies among studies on the efficacy of PKC, it is difficult to rely on such information especially when utilizing PKC in different livestock species such as Khaki Campbell duck. There is meager information on the effects of PKC on production and egg quality traits in Khaki Campbell ducks. Thus, the objective of the

To cite this paper: Samsudin AA, Hendry N and Khaing KhTh (2016). Effects of Feeding Dietary Palm Kernel Cake on Egg Production and Egg Quality of Khaki Campbell Duck. *J. World Poult. Res.* 6(1): 01-05.
Journal homepage: http://jwpr.science-line.com/

current study was to determine the effects of feeding different levels of PKC on the growth changes, egg production and egg quality of Khaki Campbell ducks.

MATERIAL AND METHODS

Twenty seven female Khaki Campbell ducks of 18 weeks of age with an average body weight of 1.25 kg to 1.40 kg were used in the study. Ducks were randomly assigned into 9 different pens. Each pen contained three ducks. The pens were randomly assigned to three experimental diets; T1: basal diet (control), T2: basal diet + 25 % PKC, and T3: basal diet + 35 % PKC. Dietary treatments were formulated to meet the nutrient requirement of laying ducks based on the recommendation of National Research Council (Table 1). The proximate composition of the feed samples was analyzed according to the procedure of AOAC (1990).

Birds were fed twice a day at 7.30 am and 4.30 pm. Upon the arrival of the ducks till the end of week 4, commercial diet was given to all treatment groups. Starting from week 5 to the end of week 6 the commercial diet was gradually reduced and replaced with the experimental diet. Data were collected from week 7 until week 10. Feed intake, body weight changes and feed conversion ratio, weekly egg production and the hen-day egg production were documented. The eggs were collected twice a day at 8.00 am and at 5.00 pm were stored in a refrigerator at 20℃ until egg analysis.

Analysis of the egg weight, haugh unit and yolk color were done using the egg analyzer machine. For egg shell thickness, egg shell was left on the egg tray to dry for one day. The next day, the inner shell membrane was removed and a vernier caliper was used to measure the top and bottom thickness of the shell.

Table 1. Nutrient composition of the experimental diets

Ingredients (%)	T1 (control)	T2 (PKC15)	T3 (PKC35)
Corn	65.66	53.44	36.92
PKC	-	15.00	35.00
Soybean meal	20.16	17.86	15.90
Fish meal	3.00	3.00	3.00
Wheat pollard	7.00	4.30	0.40
Palm oil	1.00	3.20	6.50
Salt	0.25	0.25	0.25
Vitamin	0.05	0.05	0.05
Minerals	0.05	0.05	0.05
Dicalcium phosphate	2.70	2.70	2.70
Limestone	0.60	0.60	0.60
DL-Methionine	0.04	0.05	0.06
L-lysine	0.04	0.05	0.07
Calculated ME, kcal/kg	2913.9	2914.6	2928.2

PKC15, basal diet containing 15% PKC; PKC35, basal diet containing 35% PKC; ME, metabolisable energy

Table 2. Chemical composition of the experimental diets

Ingredients (%)	T1 (control)	T2 (PKC15)	T3 (PKC35)
DM (%)	88.31	90.67	92.51
CP (%)	15.00	15.00	15.00
EE (%)	3.74	5.65	7.29
CF (%)	2.67	4.31	6.84

PKC15, basal diet containing 15% PKC; PKC35, basal diet containing 35% PKC; DM, dry matter; CP, crude protein, EE, ether extract, CF, crude fiber

Statistical analysis

The experiment followed a completely randomized design. Data were subjected to the GLM procedure of SAS. Differences between treatment means were compared using Dunnett's test.

RESULTS AND DISCUSSION

The chemical composition of the feedstuffs and experimental diets are presented in Tables 1 and 2 respectively. Supplementation of PKC increased the dry matter, ether extract and crude fibre content of the diets. Nonetheless, the diets were isocaloric and isonitrogenous.

The effect of dietary PKC on body weight changes in Khaki Campbell ducks is shown in Figure 1. Regardless of the diet, the initial weight of the ducks was higher than the final weight. However, the decrease in weight was only significant for ducks fed 0 and 15% PKC. The decrease in body weight during the laying period could be due to the mobilization of body nutrient reserves for egg production. The lower body weight changes observed in birds fed 35% PKC diet compared to those fed 0 and 15% PKC could be due to the increase in dietary fat as dietary PKC increased in diet. Dietary fat is an efficient source of energy for livestock (Zulkifli et al., 2007).

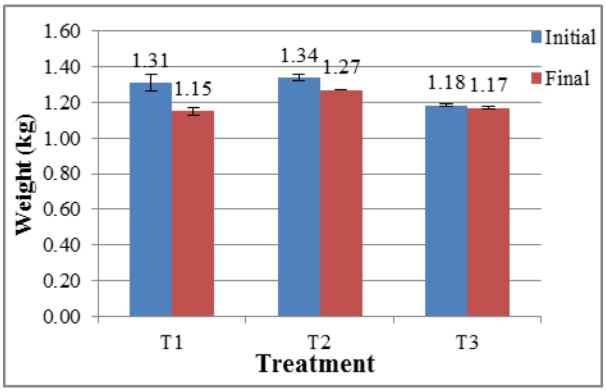

Figure 1. Growth changes of the Khaki Campbell duck after 10 weeks of experimentation.

Birds fed 15% and 35% PKC had higher (P<0.05) feed intake compared with those fed the control diet (Table 3). This observation could be attributed to the need to compensate for the lower digestibility of PKC. PKC is a fibrous feed known to have low viscosity, low water holding capacity and high bulk density (Onwudike, 1986). These features make PKC to have a high rate of passage in the digestive tract. In addition, the nutrients in fibrous feeds such as PKC would not be readily released because such nutrients are diluted with the fibre content (Onwudike, 1986). Thus, birds need to adjust their feed intake in order to obtain the nutrients and energy required for optimal production performance (Afolabi et al., 2012). Birds eat to satisfy their energy requirements (Leeson et al., 2001).

Nonetheless, since the dietary treatments were isocalaric, it can be ruled out that the ducks eat more PKC based diets to meet their energy requirements. There is a possibility that the ducks eat to satisfy their high demand of amino acid requirements for egg production. This assertion corroborates the findings of earlier studies wherein voluntary feed intake in broilers increased when dietary protein content was reduced from 24% to 16% (Edmonds et al., 1985 and Parsons et al., 1984). Onwudike (1986) posited that the high fiber content in PKC led to less availability of amino acids needed for egg production in birds. The higher feed intake in ducks fed PKC diets could also be attributed to the palm oil added to the diets. Dietary fats promote feed palatability and stimulate metabolizable energy and feed intakes in birds (Zulkifli et al., 2007). The higher feed intake observed in ducks fed PKC-based diets was in agree with the findings of Chong et al. (2008) who observed that laying hens fed 12.5% and 25% PKC had higher feed intake and lower feed efficiency compared with those fed the control diet.

Table 3. Feed Consumption and Feed Conversion Ratio of the Khaki Campbell duck after 10 weeks of experimentation

Treatment	Weekly Feed Intake(g)	Feed Conversion Ratio
T1	1021.20 ± 70.89	6.25 ± 0.67
T2	1425.31 ± 71.66 ***	5.12 ± 0.24
T3	1337.94 ± 91.29 ***	5.53 ± 0.50
Pr	NS	NS

NS: Not significantly different (P>0.05), ***significantly different at 5% level (P<0.05); Pr: probability, T1: control diet, T2: 15% PKC, T3: 35% PKC

Table 4. Egg production and percent duck-day production of the Khaki Campbell duck after 10 weeks of experimentation

Treatment	Weekly Egg Production(g)	% hen-day production
T1	4.202 ± 0.447	60.019 ± 6.386
T2	4.230 ± 0.411	60.417 ± 5.880
T3	5.397 ± 0.512	77.083 ± 7.324
P value	NS	NS

NS: Not significantly different (P>0.05), T1: control diet, T2: 15% PKC, T3: 35% PKC

Table 5. Egg weight, egg haugh unit, egg shell thickness, egg yolk color of the Khaki Campbell duck after 10 weeks of experimentation

Treatment	Egg Weight (g)	Egg Haugh Unit	Egg Shell Thickness (mm)	Egg Yolk Color
T1	59.52 ± 1.01	41.57 ± 2.24	0.30 ± 0.004	5.70 ± 0.20
T2	65.75 ± 0.79***	35.21 ± 1.77	0.31 ± 0.01	5.22 ± 0.20
T3	63.24 ± 0.55***	38.34 ± 2.36	0.30 ± 0.01	5.93 ± 0.27
P value	***	NS	NS	NS

NS: Not significantly different (P>0.05), ***significantly different at 5% level (P<0.05). T1: control diet, T2: 15% PKC, T3: 35% PKC

Dietary PKC had no effect (P>0.05) on the FCR (Table 3). These finding contrasts with those of Chong et al. (2008) who observed that birds fed 12.5% and 25% PKC had lower FCR compared with those fed the control diet. In addition, Afolabi et al. (2012) observed that Nigerian indigenous laying birds fed 20 to 40% PKC had lower FCR compared to those fed control diet. The authors also observed that birds fed 50% PKC diet had poorer FCR compared to the control (P<0.05).

Egg production and the hen-day production percentage were not influenced (P>0.05) by dietary PKC (Table 4). The findings are in line with those of Chong et al. (2008) who observed that laying hens fed 12.5% or 25% PKC were able to maintain their production performances. Onwudike (1988) posited that PKC could be used up to 40% in layers' diet without detrimental effect on production performance. The authors observed a reduction in egg production and feed intake when more than 40% PKC was supplemented. Perez et al. (2000) observed reduced egg production when 50% PKC was supplemented. Afolabi et al. (2012) also observed that layers fed 50% PKC had the least hen-day production when compared to those fed 0, 10, 20, 30 and 40% PKC.

Dietary PKC improved (P<0.05) the egg mass but did not affect (P>0.05) the haugh unit, shell thickness and yolk color (Table 5). Ducks fed 15% and 35% PKC had higher egg mass compared with those fed the control diet (P<0.05). The impact of dietary PKC on egg quality traits had yielded conflicting results. Akpodiete (2008) observed that when fed dietary PKC up to 40% did not affect the internal and external qualities of the egg. Afolabi et al. (2012) demonstrated that albumin level was higher in eggs from layers fed the control and 10% PKC diets. The authors also observed that the yolk color score increased significantly as the level of PKC increased but the egg weight and egg shell thickness were similar across the diets. Chong et al. (2008) observed that layers fed the control and 12.5% PKC diets had higher egg weight compared to those fed 25% PKC. The authors also observed that the color of egg yolk became paler as dietary PKC increased in diet.

CONCLUSION

The results of the present study demonstrated that Khaki Campbell ducks can tolerate up to 35% PKC in their diet without deleterious effect on laying performance and egg quality characteristics.

Competing interests

The authors have no competing interests to declare.

REFERENCES

Adesehinwa AOK (2007). Utilization of palm kernel cake as a replacement for maize in diets of growing pigs: effects on performance, serum metabolites, nutrient digestibility and cost of feed conversion. Bulgarian Journal of Agricultural Science, 13(5): 591.

Afolabi KD, Akinsoyinu AO, Omojola AB and Abu OA (2012). The performance and egg quality traits of Nigerian local hens fed varying dietary levels of palm kernel cake with added palm oil. The Journal of Applied Poultry Research, 21(3): 588-594.

Akpodiete OJ (2008). Performance response and egg qualities of laying birds fed enzyme supplemented Palm Kernel Cake (PKC) based diets. Animal Research International, 5(1): 819-822.

Alimon AR (2004). The Nutritive Value of Palm Kernel Cake for Animal Feed. Palm Oil Development. No. 40, June 2004. Malaysian Palm Oil Board.

AOAC (1990). Official methods of analysis. (15th ed.). Arlington, VA: Association of Official Analytical Chemists. pp. 931-932.

Chong CH, Zulkifli I and Blair R (2008). Effects of dietary inclusion of palm kernel cake and palm oil, and enzyme supplementation on performance of laying hens. Asian-Australasian Journal of Animal Science, 21(7): 1053-1058.

Department of Veterinary Services. (2013). Daily report: Price fresh meat, frozen meat, poultry and animal feed. http://www.dvs.gov.my/documents/10157/257809/LAPORAN+26+JULAI+2013.pdf

Edmonds MS, Parsons MC and Baker DH (1985). Limiting amino acids in low-protein corn-soybean meal diets fed to growing chicks. Poultry Science, 64: 1519-1526.

ENC. (2012). Egg Nutrition Council. http://enc.org.au/faq/

FAO. (2014). The State of Food Insecurity in the World. Assessed at www.fao.org/publications on 12/10/2015.

Leeson S, Summers JD and Caston LJ (2001). Response of layers to low nutrient density diets. Journal of Applied Poultry Research, 10: 46–52.

Sharmila A, Azhar K, Hezmee MN, and Samsudin AA (2014). Effect of xylanase and cellulase supplementation on growth performance, volatile fatty acids and ceacal bacteria of broilers chickens fed with palm kernel meal-based diet. Journal of Animal and Poultry Sciences, 3(1): 19-28.

Onuh SO, Ortserga DD and Okoh JJ (2010). Response of Broiler Chickens to Palm Kernel Cake and Maize Offal Mixed in Different Ratios. Pakistan Journal of Nutrition, 9(6): 516-519.

Onwudike OC (1986). Palm kernel meal as a feed for poultry. 1. Composition of palm kernel meal and availability of its amino acids to chicks. Animal Feed Science and Technology, 16(3): 179-186.

Onwudike OC (1988). Palm Kernel Meal as a Feed for Poultry. 4. Use of Palm Kernel Meal by Laying Birds. Animal Feed Science and Technology, 20(4): 279-286.

Orunmuyi M, Bawa GS, Adeyinka FD, Daudu OM and Adeyinka IA (2006). Effects of graded levels of palm-kernel cake on performance of grower rabbits. Pakistan Journal of Nutrition, 5(1): 71-74.

Parsons CM, Edmonds MS and Baker DH (1984). Influence of dietary electrolyte balance, energy, and amino acid supplementation on the Monensin response in chicks fed diets varying in protein content. Poultry Science, 63: 2438-2443.

Perez JF, Gernat AG and Murillo JG (2000). Research notes: The effect of different levels of palm kernel meal in layer diets, Poultry Science, 79(1): 77-79.

Yeong SW, Mukherjee TK and Hutagalung RI (1981). The Nutritive Value of PKC as a Feedstuffs for Poultry. pp. 100–107, in: Proceedings of the National Workshop on oil palm by - products utilization, Kuala Lumpur, Malaysia.

Zanu HK, Abangiba J, Arthur-Badoo W, Akparibo AD and Sam R (2012). Laying chickens' response to various levels of palm kernel cake in diets. International Journal of Livestock Production, 3(1): 12-16.

Zulkifli I, Htin NN, Alimon AR, Loh TC and Hair-Bejo M (2007). Dietary selection of fat by heat-stressed broiler chickens. Asian-Australasian Journal of Animal Sciences, 20(2): 245.