Effect of Palm Kernel Cake (PKC) Inclusion and Multi-Enzyme Supplementation on Layer Performances

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ABSTRACT
Palm kernel cake (PKC) has been used in poultry diets with limited amounts to decrease the feed cost. An experiment was designed to study the effect of PKC inclusion and the addition of a commercial multi-enzyme (DGDP) into diets of laying hens. A control diet without PKC and a diet with 10% PKC was formulated to meet the requirement of 40 weeks laying hens, 4 dietary treatments were formulated. Each diet was fed to 12 replicates of laying hens reared in individual cages, and the performances were measured for 10 weeks. Results showed that the inclusion of 10% PKC did not affect the feed intake, henday, egg weight, FCR, HU, and eggshell thickness significantly, but decreasing the egg yolk score by 13,46%. The addition of enzymes into the control diet did not affect the performances of laying hens and slightly decrease the eggshell thickness. It is concluded that the inclusion of 10% of PKC in 40 weeks laying hens-diet could be practiced to reduce the feed cost without affecting the performances of the layer.

Keywords: *Palm kernel cake, layer, multi-enzyme*

1. INTRODUCTION

Palm kernel cake (PKC) is an unconventional feed that contains high fiber, a moderate level of protein, and low energy. The PKC has 16.95% crude protein and 3911.7 kcal/kg gross energy with 29.52% hemicellulose and 36.73% cellulose [1]. It shows that Palm kernel cake potentially used as poultry feed. The PKC and palm kernel meal (PKM) has been used as fed to other birds such as quails [2], broilers [3-5] and also pigs [6,7]. The PKC inclusion decreases the digestibility of dry matter (DM) and ether extract in broiler chickens [9], but that digestibility can be improved by enzyme addition [9]. Another study [8] shows high fiber feed can improve the ileal digestibility of DM and fat in the layer.

Previous study [9] shows that addition of enzyme β-mannanase can improve the digestibility of diet, which is supplemented by PKC. The addition of Multi purposes enzymes (xylanase, glucanase, cellulase, pectinase, hemicellulose, amylase, etc.) increased the dry matter (DM) and crude fiber digestibilities compared to control or addition of single enzyme, such as xylanase or phytase [10]. Those treatments will lead to an increase the animal performance. Previous study [11] showed an improvement in broiler performances by feeding treated PKM with an enzyme.

This study was conducted to evaluate the effect of PKC inclusion in layer feed. This study also aimed to evaluate the effect of multi-enzyme addition in the diet supplemented with PKC.

2. MATERIALS AND METHOD

2.1. Animals

This research was conducted in Indonesia Livestock Research Institute using 40 weeks old laying hens. A total of 48 Layers were completely randomized into factorial design 2x2 (2 levels of PKC and 2 kinds of enzyme supplementation). The laying hens were reared in wire individual cages (34cmx30cmx34cm) for 10 weeks of observation. The birds were freely accessed to feed and drinking water.

2.2. Experimental Diets

Multi-enzyme used in this study was Dige Grain Delta Plus (DGDP distributed by PT. Tirta Buana

Kemindo Tbk) claimed to contain enzymes with the activity 800.000 U/kg amylases, 2.500.000 U/kg mannanase, 600.000 U/kg xylanases, 3.000.000 U/kg cellulase, 1.000.000 U/kg pectinase, 500.000 U/kg β-glucanase, 1000.000 U/kg proteases, and 1.000.000 U/kg phytase. Two levels of PKC (0% and 10%) with 2 levels of multi-enzyme supplementations (with and without) were formulated in this study: 1) Control: Feed neither formulated using PKC inclusion nor multi-enzyme supplementation; 2)PKC 10%: Feed formulated with 10% PKC, without supplemented multi-enzyme; 3) Control + Enzymes: Feed formulated without PKC inclusion, but supplemented with 750 g multi-enzyme/ton feed; and 4)PKC10% + Enzymes: Feed formulated with 10% PKC and supplemented with 750 g DDGP/ton feed. The nutrient compositions of the feeds were made similar as shown in Table 1.

Table 1. Nutrient compositions of experimental feed.

Nutrient composition (%)[1]	0%PKC	10%PKC
Dry matter	88.6	89.6
Crude Fiber	2.9	4.8
Metabolized Energy (kcal/kg DM)	2700	2700
Crude Protein	17.7	17.7
Ether Extract	4.4	7.4
Calcium	4.1	4.1
Available phosphor	0.38	0.38
Lysin	0.867	0.857
Methionine	0.461	0.46
Methionine + Cystine	0.722	0.729
Tryptophan	0.199	0.203
Threonine	0.645	0.62
Digestible Lysine	0.763	0.76
Digestible Methionine	0.42	0.42
Digestible Methionine + Cys	0.646	0.655
Digestible Tryptophan	0.182	0.185
Digestible Threonine	0.582	0.563

[1]=unless it is stated in the line

Table 2. Performances laying hens fed palm kernel cake and multi-enzyme supplementation from 40-50 weeks old.

Parameters	0%PKC		10%PKC		p-value		
	- E	+ E	- E	+ E	PKC	E	PKC*E
Feed intake (g/head/day)	107.8 ± 9.51	108.8 ± 8.16	111.49 ± 10.19	107.74 ± 7.88	0.503	0.452	0.213
Egg weight (g)	60.19 ± 1.93	59.39 ± 4.30	60.07 ± 3.68	59.37 ± 3.64	0.951	0.474	0.959
Henday (%)	96.49 ± 4.30	94,42 ± 4,76	94.52 ± 3.70	92.62 ± 5.87	0.185	0.161	0.951
FCR	1.86 ± 0.18	1.95 ± 0.09	1.97 ± 0.12	1.97 ± 0.16	0.154	0.298	0.355

FCR = Feed Convertion Ration; PKC = Palm kernel cake; E = Enzymes

2.3. Parameters Observed and Data Analysis

The eggs were collected and weighed every day, meanwhile, the feed intake was weighed once a week. Egg quality consisting of Haugh Unit (HU), Yolk score, and eggshell thickness were observed at the end of the trial or 50 weeks of age. The Henday (%) and feed convertion ration (FCR) were calculated using the formula (1) and (2), respectively :

$$Henday\ (\%) = \frac{p}{(dxn)} x100\% \qquad (1)$$

$$FCR = \frac{Total\ intake\ (g)}{Total\ egg\ production\ (g)} \qquad (2)$$

While p is total eggs production of the layer during observation, d is total day of observation (day), and n is total hens alive every observed day (head/day).

After 10 weeks of observation, all the data collected were tabulated and analyzed using Analysis of Variances in a 2x2 factorial completely randomized design, if the result was significant (P<0,05) then followed by Duncan test. All statistic analysis using software SBM SPSS Statistic 25

3. RESULT AND DISCUSSION

3.1. Performance of Layer

The result of this study shows in Table 2. The result showed that no significant (P>0.05) different effect of PKC inclusion and Multienzyme supplementation on performances of the layers. This result is similar to previous study [12], who reported that egg weight, henday production, and FCR were not significantly different between control and diets contained 10%PKC. The Henday egg production was slightly higher and the FCR was lower in layers fed the control feed, but it was in a very small amount.

The inclusion of 10% PKC in the diet tends to increase the feed intake as compared to the control, it could be indicated that PKC addition can improve the feed palatability in the layer. Also, the inclusion of PKC can reduce the cost of production by decreasing the feed cost. Multi-enzyme supplementation on a 10% PKC diet reduced the feed intake which also reduced feed cost without affecting layer production. The 10% PKC diet without multi-enzyme supplementation had a slightly higher feed intake compared to Control (Figure 1), but after supplemented using multi-enzyme, the patterns of feed intake were similar (Figure. 2).

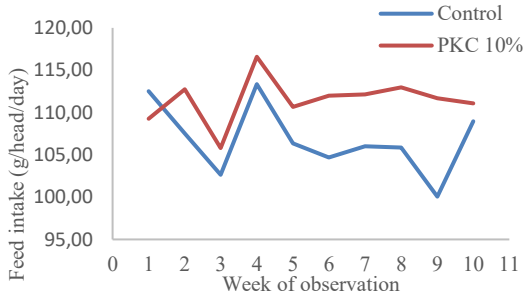

Figure 1. Feed Intake of layer fed PKC

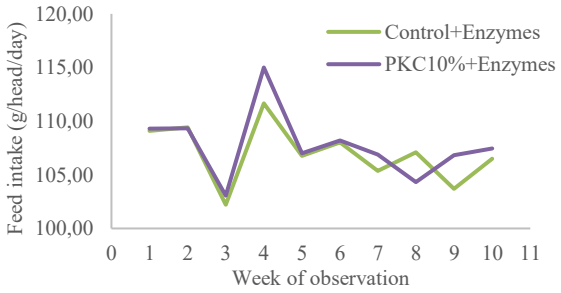

Figure 2. Feed Intake of layer fed supplemented feed

The egg weight of hens fed 10% PKC and control were similar, with or without multi-enzyme supplementation (Figure. 3 and Figure. 4). The henday egg production of the control birds was slightly higher as compared with other treatments, but the standard deviation was also higher than other treatments. Based on the egg production shown in Figure. 5 and. 6, this study found that after 3 weeks of treatment (>43 weeks old

layer), the henday egg production of birds fed 10% PKC started to increase compared to the control if there's no multi-enzyme supplementation (Figure. 5). However, when the multi-enzyme was supplemented, birds fed the 10% PKC start to increase after 4 weeks of treatment (>44 weeks old layer) compared to Control (Figure. 6).

There was no difference (P>0.05) effect of multienzyme supplementation on feed contains PKC on Feed intake, henday egg production, and egg weight. [13] also reported similar results when 0.01% Multienzyme (10.000 IU cellulase, 200 IU β- glucanase, 10.000 IU xylanase, 2. 500 FTU phytase) supplemented in feed contained 40% PKC. Meanwhile, the addition of 0.1-0.2% of carbohydrase cocktail (107.000 U α-galactosidase, 2300 U protease, and 12.081 U β-mannanase/g) on feed contains 5% of PKC (added 1.208.100-2.416.200 U β-mannanase/kg of feed) can improves the feed digestibility [14].

Table 3. The egg quality of Laying hens fed palm kernel cake and multi-enzyme supplementation from 40-50 weeks old.

Parameters	0%PKC		10%PKC		p-value		
	- E	+ E	- E	+ E	PKC	E	PKC*E
HU	91.6 ± 2.94	92.2 ± 4.2	92.52 ± 3.97	93.92 ± 3.15	0.263	0.379	0.708
Yolk Score	7.80 ± 0.63a	7.64 ± 0.67 a	6.75 ± 0.97 b	6.82 ± 0.75 b	<0.01	0.840	0.623
Eggshell thickness (mm)	0.15 ± 0.06a	0.12 ± 0.02 b	0.13 ± 0.02 a	0.10 ± 0.02 b	0.150	0.017	0.919

HU= Haugh Unit; PKC = Palm kernel cake; E = Enzymes; *Different letter in the same row shows the different effect of treatments (P<0.05)

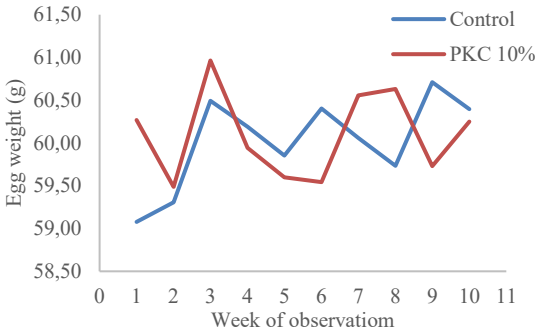

Figure 3. Egg weight of layer fed PKC

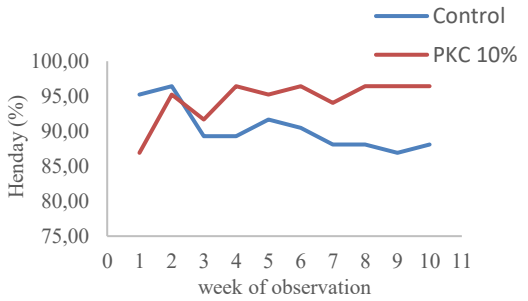

Figure 5. Henday of layer fed PKC

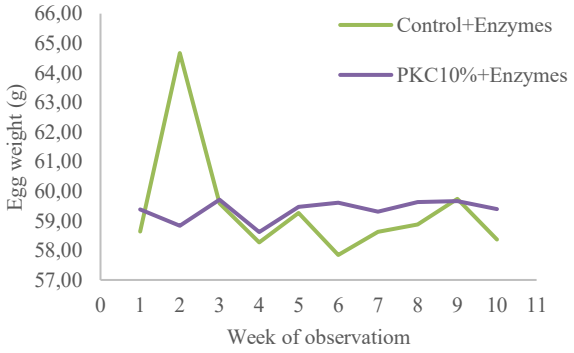

Figure 4. Egg Weigh of layer fed supplemented feed

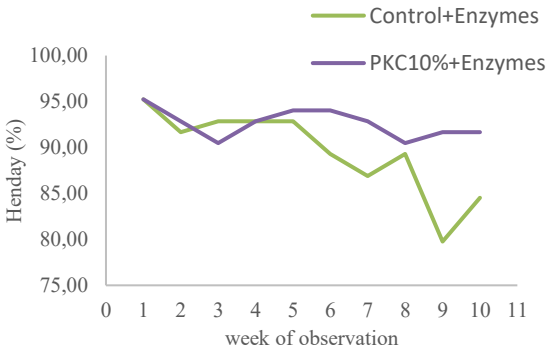

Figure 6. Henday of layer fed supplemented feed

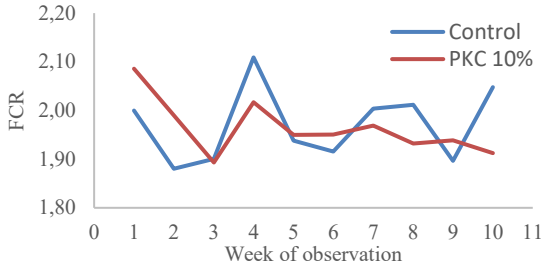

Figure 7. FCR of layer fed PKC

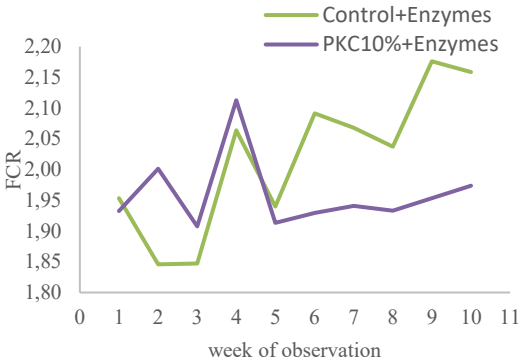

Figure 8. FCR of layer fed supplemented feed

This research only added 0.075% of multi-enzyme in feed contains 10% PKC (added 187.500 U mannanase/kg of feed), a smaller amount of enzyme as compared to [14]. Therefore, supplementation of a higher level of multi-enzymes potentially improved the performance of laying hens. *In vitro* study showed that the optimum addition of mannanase for improving reducing sugar, total sugar, and protein release of 14% PKC was 500 units (predicted result 750 units) that incubated for 6 hours [1].

3.2. Egg Quality

The results on the egg quality in this study are presented in Table. 2. There was no difference (P>0.05) effect of treatments on HU and eggshell thickness of the eggs, which similar to the finding of [12] that fed laying hens 0% and 10% palm kernel cake. Meanwhile, the inclusion of 10% PKC in the diet significantly (P<0.01) decreased the yolk score as compared to the control. This result was similar to the finding of [15], both with or without multi-enzyme supplementation. The inclusion of 10% PKC in the diet caused the egg yolk to paler by 13,46% than the control. Also, there was a significant (P<0.05) decrease in the eggshells-thickness when enzymes were included in the diet, both with or without palm kernel inclusion.

4. CONCLUSION

Palm kernel cake could be included in laying hens feed by 10% without affecting the performances of laying hens aged >40weeks old, although the yolk score was paler by 13.46%. The addition of 750 g multi-enzyme/ton feed did not affect the performance of laying hens >40weeks old and egg quality but slightly decreased the eggshell thickness.

This research was supported by PT Kemindo TBK which also provides multi-enzyme used in this experiment.

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