

EFFECT OF PRESERVED DECANTED PALM OIL MILL EFFLUENT (POME) ON GROWING POULTRY

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RINGKASAN

Efluen kilang kelapa sawit (POME) yang telah disiring dan kemudiannya diawet dengan natrium benzoat (2 g/kg) didapati mengandungi 21%–23% bahan kering dan 15.7% protein kasar (berdasarkan bahan kering). POME telah dicampurkan ke dalam makanan ayam pedaging pada aras 10% dan makanan itik Pekin pada aras 20% untuk meneliti penerimaannya dan menilai prestasi tumbesaran kedua-dua jenis ternakan tersebut. Dalam kedua-dua percubaan ini makanan-makanan tersebut telah dibandingkan dengan makanan asas jagung-soya (makanan kawalan) dan satu makanan lagi yang mengandungi POME kering yang didapati daripada proses mekanikal. Keputusan menunjukkan bahawa penghadaman bahan kering dan retensi nitrogen di dalam makanan yang mengandungi 10% POME yang disiring adalah paling tinggi jika dibandingkan dengan ayam yang diberi makanan kawalan dan makanan dengan efluen kering. Walau bagaimanapun, kumpulan kawalan adalah lebih baik di dalam kedua-dua variabel yang diukur daripada kumpulan yang diberi makanan campuran efluen kering. Dalam satu percubaan pemakanan ayam pedaging, selama tiga minggu (umur antara empat hingga enam minggu), kadar pengambilan makanan yang rendah, berat badan yang tinggi dan kecekapan penukaran makanan yang lebih baik telah didapati daripada ayam dan itik yang diberi makanan yang mengandungi POME yang telah disiring. Pemberian makanan yang berasaskan makanan POME kering telah mengakibatkan penurunan berat badan. Dalam percubaan itik Pekin, selama lima minggu (umur 4–8 minggu), kumpulan ternakan yang menerima POME yang disiring mempunyai berat badan yang lebih berat dengan kecekapan penukaran makanan yang lebih baik dibandingkan dengan kumpulan yang lain, walau bagaimanapun perbezaannya tidak ketara. Daripada segi kualiti karkas pula didapati tidak banyak perbezaan di antara ketiga-tiga kumpulan itik tersebut. Sebagai kesimpulan, POME yang disiring adalah lebih mudah dihadam dan lebih digemari oleh ayam dan itik daripada POME yang dikeringkan dengan cara mekanikal.

INTRODUCTION

Dehydrated palm oil mill effluent (POME) had been used in broiler and duck diets with optimum inclusion levels of 15% and 10% in broiler and layer diets respectively (YEONG, 1980; YEONG, MUKHERJEE, SYED ALI and JAMALUDIN 1982) and 10% in growing duck diets (YEONG and FAIZAH, 1982). In a recent layer trial using POME from a different palm oil mill, the optimum inclusion level can be as high as 20% (YEONG, 1987a). The better response to POME inclusion in this trial could be due to the difference in processing methods between the palm oil mills. The temperature and time of dehydration could play a vital role in affecting the nutritive quality of the POME. Owing to the economic situation, there are many palm oil mills producing their POME

from a decanter without installing a drier. The POME is being disposed as wet fertilizing material to the field. It becomes mouldy rapidly and renders the environment very unhygienic. In view of this problem, trials were carried out to preserve this decanted sludge by suppressing mould growth. Attempts were also made to feed this preserved POME to livestock. This paper reports two feeding trials using the preserved POME in broiler and Pekin duck diets.

MATERIALS AND METHODS

A digestibility and two feeding trials were carried out to study the acceptability and nutritive value of decanted POME in chickens and Pekin ducks. The POME was obtained from a nearby palm oil mill. It

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Table 1. Experimental broiler and duck diets

Ingredient	Broiler diet ¹ (%)		Duck diet ² (%)	
	Control	POME basal	Control	POME basal
POME ³	—	10.0	—	20.0
Broken rice	—	—	71.0	55.6
Corn	61.1	51.0	—	—
Fish meal	5.2	8.0	3.0	5.7
Soybean meal	29.6	24.6	20.5	14.0
Palm oil	1.0	3.3	2.0	2.0
Dicalcium phosphate	1.1	1.6	2.2	2.1
Vitamin-mineral premix	0.3	0.3	0.3	0.3
Salt	0.3	0.3	0.3	0.3
Limestone powder	1.2	0.4	0.6	—
L-lysine	—	0.2	—	—
DL-methionine	0.2	0.3	0.1	—

¹The diets contain 21.2% CP and 3 000 kcal/kg ME.

²The diets contain 16% CP and 2 824 and 2 720 kcal/kg ME, respectively.

³POME (broiler): Convert to 47.6% when decanted POME, containing 21% DM, was used.

POME (duck): Convert to 95.2% when decanted POME, containing 21% DM, was used.

contains 21%–23% dry matter. On an oven-dried basis, it has the following: Dry matter (DM) 94.3%, crude protein (CP) 15.4%, crude fibre (CF) 25.4%, ether extract (EE) 13.4% and ash 14.1 percent. It was mixed with sodium benzoate in 2 g/kg basis and was used for three days before it was replaced by a new sample (YEONG, 1987b). In the digestibility trial, three test diets were prepared. These included a corn-soy control diet and two other diets containing either 10% decanted POME (on DM basis) or mechanically dehydrated POME. All the diets contained 21.2% CP and 3 000 kcal/kg metabolizable energy. The test diets are shown in *Table 1*.

The decanted POME was blended in as 47.6% based on the 10% inclusion level on 21% DM. The total mixture became 137.6% instead of 100 percent. This diet was compared with another diet containing 10% mechanically dehydrated POME. Each diet was fed to four 3-week-old mixed-sex broiler chicks in the individual metabolism cages. During the test period, the birds were given five days for adaptation and three days for faeces collection. The faeces was dried immediately at 80°C for 24 hours each day after the collection. The three-day dried faeces from each bird was pooled individually and samples were sent for chemical analysis of DM and CP.

Broiler Feeding Trial

A broiler feeding trial was conducted using the same diets as in the digestibility trial (*Table 1*) from fourth to sixth week. There were four replicate groups of five chickens each for each of the experimental diet. Feed intake and body weight were recorded for three weeks. During the feeding period, feed and water were given *ad libitum* to all the birds. Means of feed intake, body weight gain and feed conversion ratio were compared using analysis of variance and Duncan's Multiple Range Test.

Duck Feeding Trial

In this trial, there were three experimental diets inclusive of a corn-soy control and two diets with either 20% decanted (DM basis) or mechanically dehydrated POME. Each diet was allotted to four replicate groups of four 4-week old Pekin ducklings (*Table 1*). The same feeding procedures as the broiler trial above was repeated for the ducklings. The duration of the trial was four weeks (fifth to eighth week). At the end of the trial, five male and five female ducklings of average body weight were selected and sacrificed for carcass studies. All the data were analysed as in the broiler trial.

RESULTS AND DISCUSSION

Digestibility

The results of dry matter digestibility (DMD) and nitrogen retention (NR) of the three diets are shown in *Table 2*. It can be observed that the DMD of the diet containing 10% decanted POME was significantly higher than those of the control and the diet with 10% dehydrated POME. There was also positive nitrogen balance for all the diets. The resultant percent nitrogen retention was significantly highest in the decanted POME-based group followed by the control and dehydrated POME-based groups. From the results, it is evident that the inclusion of decanted POME in the diet could improve its digestibility and the nitrogen retention.

Table 2. Dry matter digestibility and nitrogen retention of broiler fed diet with and without POME

Diet	% Dry matter digestibility	% Nitrogen retention
Control	67.8b	54.6ab
10% Dried POME	62.1c	48.9b
10% Decanted POME	73.4a	60.9a

^{a,b} Figures with different subscripts in the same column differ significantly at 5% level.

Growth Performance of Broilers

The growth performance of broilers receiving the three experimental diets are shown in *Table 3*. It was observed that broilers fed decanted POME-based diet had significantly lower feed intake, slightly higher body weight gain and resulted in significantly better feed conversion ratio than those fed control and dehydrated POME-based diets. In this trial, the 10% dehydrated POME-based diet seemed to be the most inferior among the three diets. This was also confirmed in the digestibility test, probably due to the higher ash content in the dehydrated POME sample.

Growth Performance of Pekin Ducks

The effect of decanted POME on Pekin duck growth was shown in *Table 4*. It can be observed that the feed intake of the ducklings fed decanted POME-based diet was in between the control (lowest) and the dehydrated POME (highest) groups. However, the weight gain and feed conversion ratio were most superior in the decanted POME-based group although the differences from the other groups were not significant. *Table 5* shows the effect of dietary decanted POME on carcass quality. It can be observed that the dressing percentage of the decanted

Table 3. Effect of wet decanted POME on the growth performance of broiler (4th–6th week)

Dietary POME level	Feed intake (g)	Weight gain (g)	Feed/gain
Control	2764.5a	1291.7	2.16a
10% Dried POME	2459.9b	1205.3	2.05a
10% Wet decanted POME ¹	2140.2c	1295.9	1.65b

¹ The actual feed intake was 3094.4 g based on 21% DM in the wet decanted POME.

^{a,b,c} Figures with different subscripts in the same column differ significantly at 5% level.

Table 4. Effect of wet decanted POME on the growth performance of Pekin ducklings (5th–8th week)

Dietary POME level	Feed intake (g)	Weight gain (g)	Feed/gain
Control	5727.1a	1541.3	3.72
20% Dried POME	6240.0c	1645.0	3.82
20% Wet decanted POME ¹	6088.5b	1665.0	3.67

¹POME based on DM basis.

^{a,b,c} Figures with different subscripts in the same column differ significantly at 5% level.

Table 5. Effect of dietary wet decanted POME on carcass quality of Pekin ducks (0–7 week) (% liveweight)

Variable %	Control	20% Dried POME	20% Wet POME
Dressing	74.8a	73.6ab	71.8b
Gizzard	2.16	2.20	2.07
Abdominal fat	1.77	2.03	1.95
Meat + skin	64.5	63.7	63.4
Skin	22.3a	25.4b	24.1ab
Bone	10.3a	9.9a	8.4b

^{a,b} Figures with different subscripts in the same row differ significantly at 5% level

POME-based group was significantly lower than those of the two diet groups. However, there were no significant differences between the wet decanted POME group and the control in terms of percent yield of gizzard, skin, abdominal fat, the amount of meat and skin. On the other hand, the bone yield was significantly lower in the wet decanted POME group compared with the other two groups ($P < 0.05$).

From these broiler and duck trials, it is concluded that decanted POME is a good ingredient to be incorporated into diets for growing poultry. These effects were also

confirmed by other feeding trials on pig and small ruminant (YEONG, 1987b). The utilization of this by-product is more feasible when the animals are reared near the palm oil mills.

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ABSTRACT

Decanted palm oil mill effluent (POME) which was preserved in sodium benzoate (2 g/kg) contained 21%–23% dry matter (DM) and 15.7% crude protein on DM basis. It was included at 10% level in broiler and 20% level in Pekin duck diets (DM basis) to test their acceptability and effect on growth performance. In both trials, the diets were compared with a corn-soy basal diet (control diet) and a diet with the same level (DM basis) of mechanically dehydrated POME. Results of the digestibility test showed that the dry matter digestibility and nitrogen retention in the diet containing 10% decanted POME were significantly higher compared with those fed with the control diet and diet with dehydrated POME. However, the control diet was more superior for these two variables than the diet with dehydrated POME. In a three-week broiler feeding trial (fourth to sixth week), lower feed intake, higher body weight gain and better feed conversion efficiency were observed in birds fed diet with decanted POME, and the lowest weight gain was obtained from birds fed dehydrated POME-based diet. In a five-week Pekin duck trial (fourth to eighth week), the decanted POME group had a slightly higher weight gain and better feed conversion efficiency, although both of these variables were not significantly different. No obvious differences were observed in carcass quality among the ducks in these three diet groups. It was concluded that decanted POME is more digestible and acceptable by chickens and ducks than dehydrated POME.

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