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THE FEEDING VALUE OF PALM KERNEL CAKE FOR BROILERS

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RINGKASAN

Satu percubaan telah dijalankan untuk menyelidik nilai gizi dari hampas kelapa sawit di dalam ransum unggas. Ransum yang sama kandungan tenaga dan protein dan mengandungi masing-masing 0, 10, 20 dan 30% hampas kelapa sawit telah diberi kepada 240 ekor anak ayam ANS 100 dari umur 15 hari hingga 56 hari. Keputusan menunjukkan kenaikan berat badan dan pengubahan makanan nyata berbeza dengan ransum perlakuan. Ransum yang terendah kandungan hampas kelapa sawit memberi kadar kenaikan berat badan dan manfaat pengubahan makanan yang terbaik. Pengambilan makanan dan peratus kadar daging karkas tidak nyata berbeza dengan ransum perlakuan. Ayam makan paling sedikit ransum yang mengandungi 30% hampas kelapa sawit. Peratus lemak dan kulit cenderung kepada penurunan dan peratus daging kepada peningkatan dengan peningkatan kadar hampas kelapa sawit. Walaubagaimanapun, hanya peratus daging sahaja nyata berbeza. Kos per kg. ransum bertambah dan keuntungan bersih berkurangan apabila lebih banyak jagung diganti dengan hampas kelapa sawit. Penggunaan hampas kelapa sawit menggantikan jagung dan kacang soya tidak memberi manfaat dari segi ekonomi.

INTRODUCTION

One of the agricultural by-products which is produced in large quantiyies in Malaysia is palm kernel cake (PKC). A total of 270,000 tonnes of air-dried PKC delate in 1979 is produced annually (DEVENDRA, 1977). The production is projected to reach 334,700 tonnes by 1981. If PKC can be efficiently utilized for animal feeding, it will save foreign exchange, prodive a cheaper and readily avaible source of animal feed ingredient as well as rendering this contry less dependent on imported animal feedstuffs.

The use of PKC in broiler rations have been reported by several workers (YEONG, 1977; NWOKOLO *et al.*, 1977 and ARMAS, A.E., 1977). The objective of this study was to evaluate the feeding value of PKC in broiler diets.

MATERIALS AND METHODS

Four diets were used and their chemical composition is shown in *Table 1*. PKC was incorporated in diet 1, 2 and 3 at the level of 10, 20 and 30% respectively, in partial replacement of soybean meal and maize. The control diet (diet C) did not contain palm kernel cake. The rations were isocaloric (3000 kcal. M.E/kg) and isonitrogenous (24% Crude protein). Minerals and vitamins were adequately supplied. Chemical analysis for the feeds were carried out according to A.O.A.C (1965) procedures and the values are shown in *Table 1*. Crude protein, calcium and phosphorus were determined by auto-analyser.

A total of 240 ANS 100 chicks were raised in a brooding compartment and fed on commercial starter diet for two weeks. At fifteen days of age, the chicks were weighed and allotted to cages each measuring 122 x 122 x 55 cm, using a completely randomized design. The treatments were replicated six times with ten birds per replicate.

The experiment commenced from day 15 and terminated on day 56. Routine vaccination programme for Newcastle disease and fowl pox was carried out. Liveweight and feed intake were recorded at bi-weekly intervals. On day 56, one bird from each replicate was randomly selected, slaughtered and dressing percentage was determined. Three dressed birds from each treatment were taken for determination of carcass composition in terms of percentage of lean meat, skin, bone and fat. Economics of broiler production was calculated. Daily liveweight

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TABLE 1: FORMULATED PERCENTAGE COMPOSITION AND CHEMICALS ANALYSIS OF EXPERIMENTAL DIETS

Ingredients	Control	Diet 1	Diet 2	Diet 3
Palm kernel cake (%)	0	10	20	30
Maize (%)	47.0	35.0	22.54	11.06
Soybean meal (%)	45.20	44.20	43.16	41.88
Palm oil (%)	4.80	7.80	11.30	14.06
Dicalcium phosphate (%)	1.5	1.5	1.5	1.5
Limestone (%)	0.7	0.7	0.7	0.7
Salt (%)	0.2	0.2	0.2	0.2
Vitamin-mineral premix* (%)	0.1	0.1	0.1	0.1
Calculated Values				
Energy, metab. (kcal/kg)	2995	2998	2993	2996
Protein (N x 6.25, %)	23.97	24.0	24.0	23.95
Lysine (%)	1.48	1.47	1.45	1.44
Methionine (%)	0.47	0.48	0.49	0.51
Analysed Values				
Energy, metab. (kcal/kg)	2996	3001	2990	2994
Protein (N x 6.25, %)	23.90	23.96	23.97	23.98
Crude fibre (%)	3.6	4.4	5.1	5.7
Crude fat (%)	7.01	9.78	12.32	15.27
Calcium (%)	0.72	0.74	0.75	0.77
Phosphorus (%)	0.68	0.69	0.70	0.70
Ash (%)	5.88	6.03	6.33	6.60
Moisture (%)	9.28	8.56	8.40	8.58

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gain, daily feed intake, feed conversion and carcass composition were statistically analysed using analysis of variance and Duncan's new multiple range test as described by STEEL and TORRIE (1960).

RESULTS

Nutritional Value of Palm Kernel Cake (PKC)

The results of performance of broilers on PKC is shown in *Table 2*. Daily feed intake was not significantly different ($P<0.05$) between treatments. However, feed consumption was the least on the diet containing the highest level of PKC. The feed consumption among the diets ranged from 86 to 98 g/bird/day.

The results showed a consistent decrease in average daily gain as the level of PKC in the diets increased. Compared with average daily gain by birds on the control diet, there was a significant decrease ($P<0.01$) in gain except birds on diet 1. The average daily gain by chickens on the 10, 20 and 30% PKC diets were respectively 2, 7

TABLE 2: PERFORMANCE OF BROILERS FED PKC

Parameter	Control	Diet 1	Diet 2	Diet 3
Feed intake (g/bird/day)	88.59±0.8	89.47±1.1	89.17±0.6	86.00±1.5
Liveweight gain (g/bird/day)	37.75±0.6^{a}	37.21±0.5^{ad}	35.17±0.4^{cd}	31.69±0.6^{b}
Feed/gain	2.35±0.02^{ae}	2.40±0.01^{ce}	2.54±0.02^{d}	2.72±0.02^{b}

a, b, c, d, e.: Figures with different superscripts in the same row differed significantly ($P<0.05$)

and 16% lower than that by the chickens on the control diet, which was reflected in higher liveweight of birds fed the control diet in comparison with other diets as shown in *Fig. 1*. The final liveweight of birds on diet C, 1, 2 and 3 were 1.79, 1.77, 16.8 and 1.53 kg, respectively. Feed conversion of chickens on the control diet was significantly superior ($P<0.01$) than the other diets except diet 1.

Economic Evaluation of PKC

An economic analysis is shown in *Table 3*. The net profit per bird for control, diets 1, 2 and 3 were M$1.78, M$1.67, M$1.36 and M$0.94. Thus the birds on the control diet gave the highest profit. This was attributed to the high weight gain and better feed conversion of birds compared with diets 1, 2 and 3. However, the inclusion of up to 30% palm kernel cake into the diet still resulted in a net profit of M$0.94 per bird.

Carcass Composition

Table 4 summarises the gross carcass composition for the different dietary treatments. Percentage of lean meat based on dressed carcass was significantly influenced ($P<0.01$) by dietary treatments. The carcass of birds receiving diet 3 had a significantly higher content of lean meat than those on diet 2 but not those on control and diet 1. Dressing percentage and percentage of bone, fat and skin were not significantly different among the treatments. However, there was a tendency towards a decrease in percentage of fat and skin as the level of PKC increased inspite of higher level of palm oil in these diets.

DISCUSSION

Nutritional Value of PKC

The results showed a decline in the rate of liveweight gain and progressively decreasing feed conversion efficiency as the proportion of PKC increased in the diets. Similar findings were reported by ARMAS, A.E. and CHICCO, C.F. (1977). This could be due to the low digestibility of PKC due its fibre content (FETUGA, 1972). The inclusion of progressively higher quantities of PKC into the diets, therefore, may have reduced the extent to which the nutrients, particularly the protein fraction, are digested. This impaired protein digestion could result in an encrusting effect of fibre on intracellular proteinaceous material (GRIGOR'EV *et al.*, 1978). In addition, impaired feed digestion could also be attributed to a faster rate of passage of the feed through the alimentary canal (FETUGA *et al.*, 1977).

The decrease in feed digestibility leads to a reduction of available nutrients such as amino acids, which would tend to be more serious when more PKC was included. This accounts for the significant reduction in growth rate and worsening of feed efficiency. These findings were in agreement with that of HEDGE *et al.*, (1978) and BAYER, *et al.*, (1978) who concluded that performance of

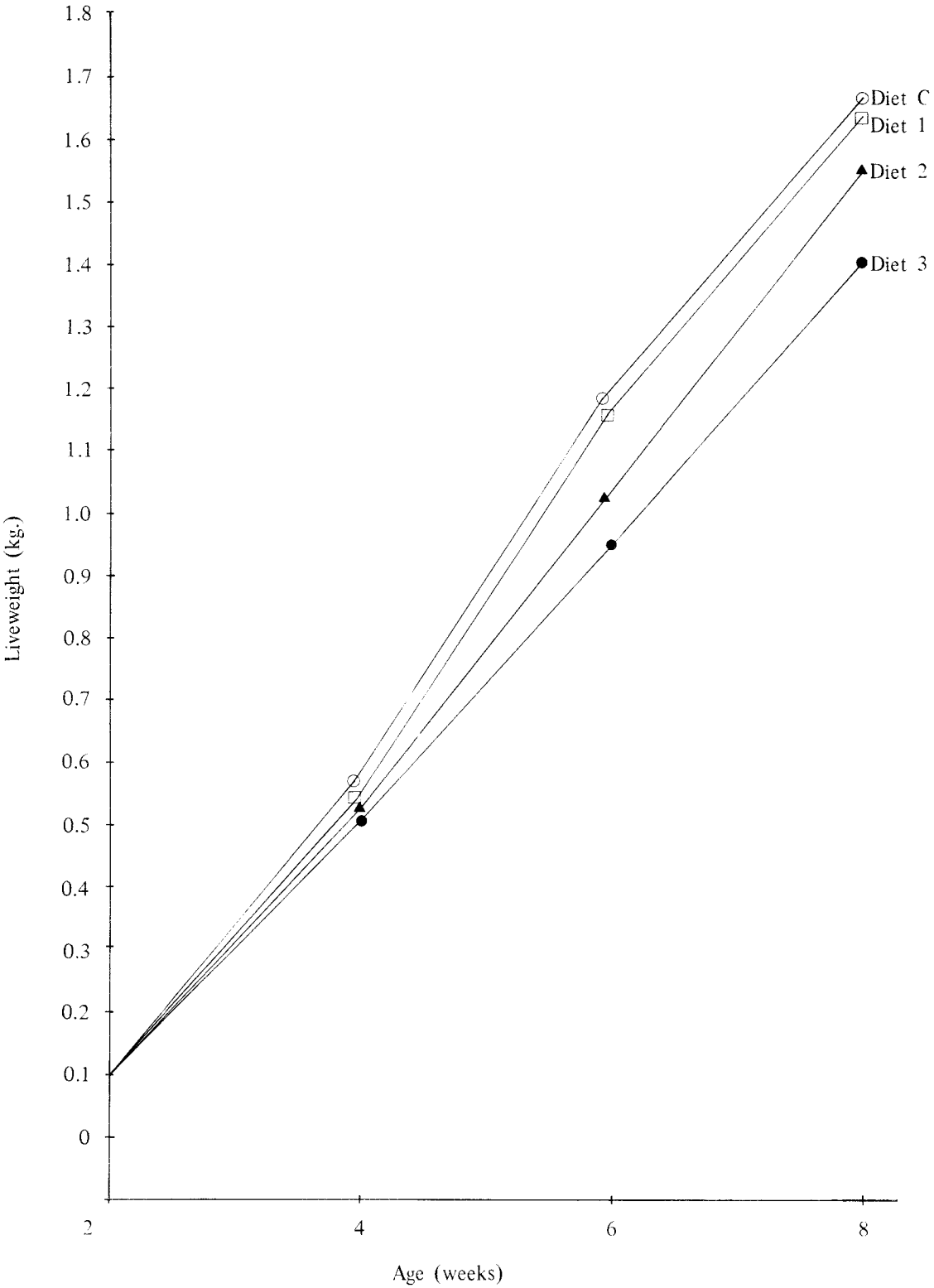

Figure 1: Effect of varying levels of palm kernel cake on liveweight of broilers at various ages

TABLE 3: ECONOMIC PERFORMANCE OF BROILERS ON PKC

	Item	Control	Diet 1	Diet 2	Diet 3
a)	Cost of day-old chick (M$)	0.80	0.80	0.80	0.80
b)	Cost of starter diet (M$)	0.145	0.145	0.145	0.145
c)	Cost of experimental diet (M$)	2.277	2.313	2.355	2.343
d)	Overhead cost (M$)* (10% of a+b+c)	0.322	0.326	0.330	0.329
	Total	3.544	3.584	3.630	3.617
a)	Average final liveweight (kg)	1.790	1.767	1.680	1.535
b)	Selling price (M$/kg liveweight)**	2.970	2.970	2.970	2.970
c)	Selling price (M$/bird)	5.320	5.250	4.990	4.560
	Net profit per bird (M$)	1.776	1.666	1.360	0.943
	Net profit for 1000 birds (M$)	1776	1666	1360	943

* Overhead include building depreciation, water, electricity, medication and labour. Based on the suggestion by Raghavan *et al.*, 1978, overheads ranged from 8 – 12% of total cost.

**Selling price of chicken per kg. liveweight was at M$2.97, based on market price of 12th. December, 1979.

TABLE 4: CARCASS COMPOSITION OF BROILERS FED PKC BASED DIETS

Item	Control	Diet 1	Diet 2	Diet 3
Lean meat (%)	48.76 ± 0.8^{bc}	49.58 ± 0.7^{b}	45.06 ± 1.1^{ac}	51.56 ± 0.9^{b}
Fat (%)	5.93±0.9	6.00±0.9	5.85±0.7	5.80±0.7
Skin (%)	11.94±1.2	11.76±1.4	11.69±1.2	11.60±1.0
Bone (%)	16.54±0.8	16.61±0.7	16.54±0.7	16.44±0.5
Dressing %	76.42±1.4	76.84±1.1	76.57±1.3	75.88±1.3

a, b, c Figure with different superscripts in the same row differed significantly at 1% level.

broilers deteriorated as dietary crude fibre increased.

Economic Evaluation of Palm Kernel Cake

Using PKC to partially replace maize and soybean meal in the diets resulted in increasing amount of palm oil being incorporated into these diets to make up for the energy deficit. Although the price of PKC (M$0.28/kg) was lower than that of maize (M$0.41/kg), the inclusion of palm oil, the price of which was M$1.25/kg, caused diets 1, 2 and 3 to cost more per unit weight than that of the control diet. The respective price per kg. of control, 1, 2 and 3 were M$0.62, M$0.63, M$0.64 and M$0.65. This, in the addition to the depressed production performance of birds fed PKC, resulted in decreased net profit as the level of PKC in the diets increased.

Carcass Composition

The results showed that most of the carcass traits except percentage of lean meat were not significantly influenced by diets. Increasing the level of PKC resulted in

increased dietary crude fibre *(Table 1)* which exert its effect on carcass composition by inhibition on fat deposition (FETUGA *et al.*, 1977). This explains the decreasing trend of the percentage of fat and skin observed as the level of PKC increased.

Several studies (COOKE *et al.*, 1972) had shown that high lysine concentration encourage muscle development. In another experiment, it was shown that high lysine diet resulted in higher liveweight gain and carcass protein content (GRIGOR'EV *et al.*, 1978). These authors stated that lysine and methionine, when adequately supplied in diets, increased the rate of biosynthesis of some cytoplasmic protein in muscle thus intensifying muscular tissue deposition. The diets containing a larger amount of PKC had a higher level of dietary methionine but lower in lysine *(Table 1)*. The interaction between the effect of dietary lysine and methionine could have contributed to the result obtained for the percentage of lean meat.

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SUMMARY

The study was conducted to evaluate the nutritive value of palm kernel cake (PKC) in broiler ration. The experiment was carried out using isocaloric and isonitrogenous diets containing 0, 10, 20 and 30% PKC. A total of 240 ANS broiler chicks were fed diets from 15 to 56 days of age. Liveweight gain and feed conversion were significantly different among the dietary treatments, the lowest level of PKC giving the best growth rate and feed efficiency. Feed intake and dressing percentage were not significantly influenced by dietary treatments. Birds consumed least on ration containing 30% PKC. Percentage of fat and skin tended to decrease and that of lean meat increased as the level of PKC increased; only the differences for lean meat percentage were however significant. Cost per kg feed increased and net profit decreased as increasing maize fraction was replaced by PKC. There was no economic advantage of using PKC over maize and soybean meal.

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