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Effects of Graded Levels of Palm-Kernel Cake on Performance of Grower Rabbits

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Abstract: A total of forty (40) growing rabbits with an average initial weight of 921.5g were randomly allotted to five dietary treatments containing 0, 10, 20, 30 and 40% palm kernel cake as replacement for soyabean cake respectively. All diets were formulated to be isonitrogenous (20% CP). The final live weights of the rabbits were higher in the control diet compared to those on palm kernel cake diets. With the exception of the rabbits placed on 40% level of palm kernel cake daily feed intake, daily weight gain and feed efficiency values compared favourably with those on control diet. Carcass weight and weight of primal cuts expressed as percentage of carcass weight did not show any significant difference between the treatment means. Animals on 40% palm kernel cake diets had the highest ($P<0.05$) cost per kg gain compared to those on other dietary treatments. It was concluded that palm kernel cake can be used up to 30% level in a maize – soyabean meal based diet for grower rabbits without adverse effect on the performance of the animals.

Key words: Palm kernel cake, soyabean meal, grower rabbits, growth and carcass characteristics

Introduction

Rabbit is now being recognized as an economic meat producer in tropical developing countries (Nigeria inclusive) where there is an abundance of under utilized agricultural by-products. Despite this, there are no improved feeding regime as well as ways of enhancing the productive potential of the rabbits. Improving the nutritional strategies will enhance greater productivity of rabbits fed non-conventional feedstuffs and possibly provide an avenue for utilization of available feed ingredients. A possible potential benefit is dietary supplementation of palm-kernel cake. Palm kernel cake PKC), is a by-product from the palm – oil industry. It is an interesting feed ingredient for animal production due to its availability and low cost. The production is not seasonal as the oil palm tree produces fruits year round. However the peak of production falls between the months of March and May when seasonal protein meal sources are scarce and expensive (Aduku *et al*., 1988). World production of palm kernel cake in 1996 was estimated to be 2.66 million tonnes (FAO, 1998). However its use as feed ingredient is mainly utilized by ruminants because of its fibrous nature, low palatability and low availability of amino acids and energy (McDonald *et al*., 1988). Very little palm kernel meal is used for poultry and pig diet formulations because of these qualities. Reports in literature investigating its use in chickens (Onwudike, 1986a,b; Panigrahi and Powell, 1991; Oloyo, 1991; Onifade and Babatunde, 1998; Garcia *et al*., 1999; Perez *et al*., 2000: Odunsi *et al*., 2002 and Ezieshi and Olomu, 2004), Pigs (Jegede *et al*., 1994; Kim *et al*., 2001), fish (Wingkeong *et al*., 2002) and rats (Loh *et al*., 2002) are well documented. Utilization of palm kernel meal in rabbit diets has not been extensively investigated. Aduku *et al*. (1988) compared palm-kernel cake with peanut meal and sun flower meal in diets of weaner rabbits. Imasuen *et al*. (2003) also replaced maize with palm kernel meal in the diets of weaned rabbits. This study therefore aims at evaluating graded levels of palm kernel cake as replacement for soyabean meal in the diet of grower rabbits.

Materials and Methods

The study was carried out at the rabbitary unit of the Animal Science Department, Ahmadu Bello University, Zaria. forty growing rabbits of mixed breed and sexes with an average initial weight of 921.5g were used for the trial. Eight animals per treatment were randomly assigned to individual cages in a completely randomized design. Each rabbit was a replicate. The rabbits were fed the experimental diets containing 0, 10, 20, 30 and 40% inclusion levels of palm kernel cake as replacement for soyabean cake. The experimental diets are as shown in Table 1. Proximate composition of the palm kernel cake and the five experimental diets are shown in Table 2. Feed and water were given ad-libitum. The animals were allowed an adjustment period of one week before performance data were taken. The animals were weighed weekly. Data collected were used to compute daily feed intake, daily weight gain and fed to gain ratio. The experiment lasted 56 days. At the end of the feeding trial, four rabbits selected from each treatment based on the group average weight were slaughtered for carcass evaluation. Before slaughtering, the animals were starved overnight to clear the guts and live weights were recorded. The fur was removed by roasting carefully. Evisceration of the carcasses was carried out and the internal organs were weighed

Table 1: Percentage composition of experimental diets

Ingredients	Inclusion Levels of Palm Kernel Cake				
	0	10	20	30	40
Maize	54.75	48.28	41.78	35.29	28.81
Soyabean meal	32.05	28.52	25.02	21.51	17.99
Maize offal	10.00	10.00	10.00	10.00	10.00
Palm kernel cake	0.00	10.00	20.00	30.00	40.00
Bone meal	2.00	2.00	2.00	2.00	2.00
limestone	0.5	0.5	0.5	0.5	0.5
Salt	0.5	0.5	0.5	0.5	0.5
Vitamin/Mineral Premix[1]	0.2	0.2	0.2	0.2	0.2
total (kg)	100	100	100	100	100
*Price per kg feed consumed (N)	29.5	27.75	26.02	24.3	22.5
Calculated Analysis					
Crude Protein (%)	20	20	20	20	20
Metabolizable Energy Kcal/kg	2654.62	2617.15	2579.37	2541.69	2504.12

*Estimated cost of ingredients used for the trial as at the time of conducting the experiment (April – June 2003). [1]Vit A10,000 IV; Vit. D_3 2,000 iu; Vit. E8,000 iu; Vit k_2, 000mg; Vit B_{12}, 000mg; Vit B_2 5,500mg; Vit B_6 1,200mg; Vit. B_{12} 12mg; Biotin 30mg; Folic Acid 600mg; Niacin 10,000mg; Panthothenic Acid 7,000mg; Choline Chloride 500,000mg; Vit. C 10,000mg; Iron 60,000mg; Mn 80,000mg Cu 8,000mg; Zn 50,000mg; Cobalt 45mg; Selenium 100mg; mg 100,000mg; Antioxidant 6,000mg.

Table 2: Proximate composition of the experimental diets and palm kernel cake

Parameters	Grade levels of palm kernel cake in the diets					Palm kennel cake
	0	10	20	30	40	
Dry matter	90.74	90.65	90.93	90.55	90.76	90.56
Crude protein	21.6	21.15	20.54	20.05	19.88	16.58
Crude fibre	3.94	4.99	6.89	8.64	11.20	18.33
Ether Extract	2.73	2.88	3.07	3.56	3.99	5.39
Ash	5.22	4.75	4.77	6.59	5.06	6.75
NFE	62.55	60.02	58.79	57.02	55.99	47.61

separately and expressed as percentage of live weight. Head, feet and tail were removed to obtained the dressed carcass weight. The carcasses were then divided into primal parts and each part expressed as a percentage of the dressed carcass.

The data generated from this study were subjected to analysis of variance (ANOVA) and where statistical significant differences were observed, the means were compared according to Duncan's multiple range test (Duncan, 1955) using the General Linear Model (GLM) procedure of SAS (1995).

Results

The performance of the rabbits fed the various experimental \diets is shown in Table 3. The results of the trial showed that the control diet gave the highest final body weight. Daily feed intake and weight gain showed significant difference ($P<0.05$) across the dietary treatments. Feed efficiency increased as the level of palm kernel cake increased in the diets. Cost per kg gain in weight also increased linearly as the level of palm kernel cake in the diet increased. Inclusion level up to 30% compared favourably with the control but at 40% level the cost per kg gain in weight was significantly different from the control. There was no mortality in the course of the experiment.

Results of carcass characteristics (Table 4) showed that the live weights of the rabbits on 20% level of inclusion were not comparable with the control. Carcass weight as well as the primal cuts (Loin, Thigh and Shoulder) did not show any significant difference between the treatment means. Some of the internal organs (kidney, heart) were not affected by the treatment. However, the liver, lungs, weight of intestine and stomach weight all showed significant differences between the treatment means.

Discussion

The significant effect ($P<0.05$) of palm kernel meal on final live weight observed in this study agrees with the findings of Imasuen *et al.* (2003). These authors observed a significant difference in final live weight of weaned rabbits fed graded level of palm kernel cake. Ezieshi and Olomu (2004) also reported similar trend in broilers. However, Aduku *et al.* (1988) reported that palm kernel cake compared favourably with peanut in

Table 3: Performance of rabbits fed graded levels of palm-kernel cake

Parameter	Grade levels of palm kernel cake						Significance Level
	0	10	20	30	40	SEM	
Initial weight (g)	918.75	925.0	918.75	918.75	918.75	96.56	NS
Final weight (g)	1875.00^{a}	1643.75^{b}	1643.75^{b}	1631.25^{b}	1612.50^{b}	62.02	*
Daily feed intake (g)	54.64^{b}	48.26^{b}	49.29^{b}	54.32^{b}	57.68^{a}	2.81	NS
Daily weight gain (g)	17.64^{a}	14.56^{a}	14.17^{a}	13.51^{a}	11.36^{b}	3.81	*
Feed Efficiency	3.14^{a}	3.36^{a}	3.75^{a}	4.02^{a}	5.01^{b}	0.79	*
Cost/kg gain in weight (N)	92.63^{b}	93.32^{b}	97.64^{b}	97.93^{b}	112.73^{a}	18.29	*
Mortality	0	0	0	0	0	0	

Mean is a row followed by different superscripts are significantly different. NS= Not significant (P>0.05),
* = Significant (P<0.05), SEM = Standard error of mean

Table 4: Carcass characteristics of rabbits fed the experimental diets

Parameter	Grade levels of palm kernel cake						Significance Level
	0	10	20	30	40	SEM	
Liver wight(g)	1850.00^{a}	1675.00^{ab}	1553.33^{b}	1720.00^{ab}	1776.00^{ab}	77.45	*
Carcass weight (g)	1154.33	985.33	989.00	1061	997.33	71.61	NS
Loin (% carcass weight)	26.41	29.90	24.88	26.96	26.76	1.61	NS
Thigh (% carcass weight)	28.29^{ab}	28.57^{ab}	30.92^{a}	29.68^{a}	28.90^{ab}	0.86	NS
Shoulder (% carcass weight)	34.21	34.43	31.96	33.59	35.20	1.11	NS
Liver (% live weight)	2.81^{ab}	2.86^{ab}	3.07^{a}	2.16^{c}	2.15^{c}	0.18	*
Lungs (%live weight)	0.65^{bc}	0.60^{bc}	0.69^{ab}	0.73^{a}	0.55^{c}	0.37	*
Kidney (% live weight)	0.66^{ab}	0.58^{b}	0.81^{a}	0.59^{b}	0.56^{b}	0.06	NS
Heart (% live weight)	0.45	0.51	0.54	0.4	0.4	0.0058	NS
Intestine weight (%live weight)	5.42^{b}	5.59^{b}	6.13^{ab}	6.36^{ab}	6.93^{a}	0.42*	
Stomach weight (% of live weight)	0.94b	1.33b	1.41b	2.26a	2.44a	0.13	***

Mean is a row followed by different superscripts are significantly different. NS = Not significant (P>0.05), *=Significant (P<0.05),
*** = Significant (P<0.0001)

the diets of weaned rabbits without any significant difference in the final live weight. Loh *et al.*, 2002 also reported that feeding rats a diet supplemented with 15-25% palm kernel cake had no significant effect on growth rate, daily feed intake and fat weight.

Though the animals on control diet in this study had significantly higher final live weight, there were no significant differences (P>0.05) observed in the final live weight of the animals fed on diets with palm kernel cake. The result indicates the superiority of soyabean meal to PKC. The average daily feed intake did not differ significantly among the treatment means. This also confirms the reports of Aduku *et al.* (1988); Loh *et al.* (2002) and Ezieshi and Olomu (2004).

The linear decrease in daily weight gain as the level of palm kernel cake in the diet increased is an indication that the rabbits on control diet efficiently utilized the diet. However, the daily weight gain as well as the feed efficiency of the animals on 10, 20 and 30% levels of PKC inclusion compared favourably with the soyabean based control. Garcia *et al.* (1999) reported a similar trend where body weight gain and feed convention were not significantly different between the control and 10% palm-kernel meal-fed chicks but were decreased as the levels of palm kernel meal increased to 40%. Osei and Amo, (1987) reported that feeding different levels of PKC in isonitrogenous diets reduced feed efficiency but found no significant differences in body weights of broilers.

The fact that the cost/kg gain in weight was higher for rabbits fed 40% level of palm kernel meal despite the low cost per kilogram of diet at that level of inclusion could be a reflection of feed efficiency Aduku *et al.*, (1988) had reported that cost of raising one rabbit for 21 days was lower by 55% for palm kernel cake compared to peanut fed rabbits. This may be due to the short period of the trial. For carcass analysis, the higher live weight of the animals fed the control diet corresponds to the result on final live weight of the animals. The results obtained on carcass weight and weights of primal cuts contradicts earlier reports.Garcia *et al.* (1999) reported that carcass weight was reduced by all levels of palm kernel meal in broiler diets but only by 6% when 10% palm kernel cake was used. Rhule (1996) reported that dressing percentage, eye muscle area and back fat thickness were significantly affected by level of palm kernel meal in the diets of pigs. The liver and lungs increased as the level of the palm kernel cake increased and then declined. Oloyo (1991) also reported higher liver weights when broilers were fed unsupplemented guinea corn/palm kernel meal based ration. The linear increase in the weights of the intestine and stomach may be due to their involvement in the digestion process.

It can be concluded that palm kernel cake can be used up to 30% level of inclusion in diets of grower rabbits. This will result in a tremendous cost savings especially when soyabean which is expensive is limited in supply.

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