

Positive response of rabbits fed varying levels of palm kernel cake as a replacement for wheat offal



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Abstract ²Department of Animal Science, Federal University Dutse, Jigawa State

A major cost of producing rabbits is that of feed. Palm kernel cake is cheaper and locally available than wheat offal. This study was therefore, conducted to evaluate the performance of rabbits fed Palm Kernel Cake (PKC) as a replacement for Wheat Offal (WO). Twenty weaned rabbits of both sexes were used in the experiment. The rabbits were allocated to five diets, each with four replicates. Each diet contained the same quantities of ingredients but PKC and WO were varied such that diet (A) was 0% PKC and 40% WO, (B) 10% PKC and 30% WO, (C) 20% PKC and 20% WO, (D) 30% PKC and 10% WO, and (E) 40% PKC and 0% WO to measure feed intake, growth rate and feed conversion ratio. Carcass and organs of the rabbits were analysed. Average daily feed intake of rabbits recorded for diet A, B, C, D and E was 49.37, 40.05, 38.18, 39.10 and 56.05. The results revealed an insignificant difference in final weights of rabbits among all treatments which ranged from 777.50g (A) to 965.00g (E). The feed conversion ratio (FCR) was also not significant and ranged from 5.21 – 4.55 with diet A having the highest FCR. There were also no significant differences in carcass and organ weights among the treatments. The carcass weight ranged from 395.00g to 594.25g on diet A and E respectively. Diet E had the highest dressing percentage (57.70%) while the least was recorded for diet B (53.28%). It can be concluded that PKC compared favourably with WO and could be used to replace the latter without deleterious effects.

Keyword: Rabbits, palm kernel cake and wheat offal

Introduction

There is a global awareness of the shortage of animal protein supply in the tropics (Adekunle and Ajani, 1999). There is also a continuous rise in the cost of production of cattle, sheep, goats, and poultry which has prompted people to explore other less common but potential sources of animal protein like rabbits. Taiwo *et al.*, (2005) indicated several advantages of rabbit over livestock in the tropics and advocated for its increased production in Nigeria. However, as argued by Ayinde and Aromololan (1998), the cost of feeding rabbits is high and accounted for about 65.7% of the total cost of rabbit production in Nigeria. Therefore, there is a need for researchers to find cheap and readily available sources of rabbit feed in Nigeria. Rabbits, unlike poultry and swine, do not compete with man for feed stuff. The consumption and production of rabbits is also known to be

without any religious taboo. Other advantages include their prolificacy, and short generation intervals. They are easy to manage because they can be fed with kitchen wastes and other agro-industrial by-products. One of such products is palm kernel cake.

Palm kernel cake is a by-product from palm kernel industry. It is a potential non-conventional feed ingredient for animal production due to its availability and low cost (Adeshinwa, 2007). The production is not seasonal as the oil palm tree produces fruit year round. PKC is reported to have a protein content of 14-21%, the fibre content of palm kernel cake (21-23%), Dry matter of 94%, Lipid content of 8 - 17%, Ash content of 3-6 % and Gross energy values of 4,998Kcal/Kg (Boateng *et al.*, 2008).

On the one hand, the utilization of palm kernel cake in rabbit diets has not been extensively investigated, and on the other

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hand, the explosion of populations (Amadou *et al.*, 2012), requires strategies to optimise cost of production. As such, harnessing the enormous opportunity by studying nutritional abilities of rabbits could not have come at a better time, since there can be no success in raising rabbits if the rabbits produced ended up being unaffordable. Therefore, investigating the use of cheaply available feed resources like PKC in feeding rabbits cannot be over-emphasised. This study was carried out to determine the response of rabbits fed varying levels of palm kernel cake.

Materials and methods

Geographical location of the experiment area

The experiment was conducted at the rabbitry unit of Abubakar Tafawa Balewa University, Bauchi. Bauchi, a state in North Eastern part of Nigeria is located at geographical coordinates 10°33' N and 9°31' E. It is bordered by seven other states: Kano and Jigawa to the North, Taraba, and Plateau to the South, Gombe and Yobe to the East and Kaduna to the West. It occupies a total area of 49,259 01sq kilometers, representing about 5.3% of the total land mass of Nigeria. The state lies within the guinea savannah of the ecological zone with an annual rainfall of between 1000mm and 1300mm per annum. Effective rainy season starts from mid-May or sometimes early June. In contrast, the Northern part of the state starts receiving rain in late June/July. The vegetation here is not uniform, and grasses are shorter than is obtained in the Southern part of the country. The South- West region of the state is mountainous because of the affinity of the Jos-Plateau, while the Northern part is generally sandy. Relative humidity ranges from about 12% in February to about 68% in August. At the beginning of the rainy season, relative humidity is about 37%

(BSADP, 1993).

Experimental diets

Twenty weaned rabbits of both sexes were used in the experiment. The animals were allocated to five diets, each with four replicates; each replicate has a rabbit kept in a separate cage. The rabbits were weighed randomly and allocated to different treatments A, B, C, D and E. Each diet contained the same quantities of maize, groundnut cake, fish meal, bone meal, salt, methionine, lysine, and premix. Other ingredients, which were however variable, are Palm Kernel Cake (PKC), and wheat offal. The PKC was used to replace (A) 0%, (B) 10%, (C) 20%, (D) 30%, and (E) 40% of wheat offal in diets A, B, C, D, and E, respectively (Table 2).

Management of experimental animals

The experimental site is well ventilated. The feeders and drinkers were cleaned before the commencement of feeding or watering daily. The environment was also kept clean by sweeping and cleaning daily. Rabbits were weighed at the beginning of the experiment after the preliminary period of one week to determine initial weight. After that, the rabbits were weighed at a weekly interval to determine the body weight changes. Feed intake was obtained by giving 100g of feed daily to the rabbits and leftovers were collected and recorded after weighing.

Carcass characteristics and organ weight analysis

At the end of the 6th week of feeding trials, two rabbits per treatment were randomly selected and slaughtered for carcass characteristics and organ weight analysis. Rabbits were starved for 12 hours before being weighed and slaughtered. Slaughtering was done by severing the jugular vein and allowing the blood to drain for five minutes. The skin was removed and the live weight, slaughter weight, carcass weight, were measured and expressed in

Table 2: Percentage composition of experimental diets

Ingredients	Dietary levels of Palm Kernel Cake (%)				
	0 (A)	10(B)	20(C)	30(D)	40 (E)
Maize	45.31	45.31	45.31	45.31	45.31
Groundnut Cake	10.00	10.00	10.00	10.00	10.00
Wheat Offal	40.00	30.00	20.00	10.00	0.00
Palm Kernel Cake	0.00	10.00	20.00	30.00	40.00
Fish Meal	2.00	2.00	2.00	2.00	2.00
Bone Meal	2.00	2.00	2.00	2.00	2.00
Salt	0.25	0.25	0.25	0.25	0.25
Premix	0.24	0.24	0.24	0.24	0.24
Methionine	0.10	0.10	0.10	0.10	0.10
Lysine	0.10	0.10	0.10	0.10	0.10
Total	100.00	100.00	100.00	100.00	100.00
Calculated analysis					
Crude Protein (%)	16.73	16.93	17.13	17.33	17.53
Crude Fibre (%)	4.83	5.27	5.73	6.17	6.62
Calcium	1.00	1.00	1.00	1.00	1.00
Energy (Kcal of M.E/kg)	2157.06	2187.56	2218.06	2248.56	2279.06

grams (g). The head, skin, kidney, small intestine, large intestine, heart, lungs, spleen, liver, stomach, caeca, and tail, were weighed and expressed as a percentage live weight. The dressing percentage was calculated using the mathematical formula below:

$$\text{Dressing percentage} = \frac{\text{carca weight} \times 100}{\text{Live Weight}}$$

Statistical analysis

The collected data were computed and analysed with Microsoft Office Excel (2010), and the analysis of variance as described by Steel and Torie (1980) was used in separating the means. Significant differences were separated using an alpha value of 0.05.

Result

Response of weaned Rabbits fed Palm kernel cake as a replacement for wheat offal

Table 3: Performance of weaned Rabbits fed PKC as a replacement for Wheat offal

Ingredients	Dietary levels of Palm Kernel Cake (%)					SEM	LS
	0 (A)	10(B)	20(C)	30(D)	40 (E)		
Initial weight (g)	390.00	402.50	402.50	392.50	415.50	44.50	NS
Final weight (g)	777.50	845.00	862.50	875.50	965.00	67.65	NS
TWG (g)	387.50	417.50	460.00	482.50	550.00	45.09	NS
Daily weight gain (g)	9.22	9.94	10.95	11.48	13.09	1.07	NS
Daily feed intake (g)	49.37	40.05	38.18	39.10	56.05	7.91	NS
Feed conversion ratio	5.21	4.38	3.55	3.54	4.55	0.92	NS
Feed cost (N/kg)	29.50	27.02	25.30	23.50	21.50	1.76	NS
Feed cost (N/kg gain)	112.73	97.86	94.32	96.45	98.90	5.67	NS

LS= Level of Significance; NS= Not significant; TWG= Total Weight Gained; SEM= Standard Error of Means

The initial weight is presented in Table 3 showing no significant treatment effects and ranged from 390.00g – 415.50g. Diet E with 40% inclusion level of palm kernel cake had the highest initial weight (415.50g). There was no significant

difference on the final weight which ranged from 777.50g – 965 g, with diet E (40% PKC) having the highest final weight 965g. Rabbits on all diets gained weight; however, there were no significant differences in total weight gained (TWG)

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among the dietary treatments. The TWG ranged from 387.50 g – 550.00g. Rabbits on the diet E (40% PKC) had higher TWG than others. Furthermore, there were no significant differences in daily weight gained (DWG) among the dietary treatments. The DWG ranged from 9.22g – 13.09 g. Rabbits on the diet E (40%PKC)

had higher DWG than others with 13.09 g. There were also no significant treatment effects on the daily feed intake (DFI). The DFI ranged from 49.37 g – 56.05 g, with diet E (40% PKC) having the highest final weight 56.05g. The FCR ranged from 5.21 – 4.55, with diet A (0% PKC) having the highest FCR.

Table 4: Carcass characteristics of weaned Rabbits fed Palm Kernel Cake as a replacement for Wheat offal

Ingredients	Dietary levels of Palm Kernel Cake (%)					SEM	LS
	0 (A)	10(B)	20(C)	30(D)	40 (E)		
Live weight	710.00	775.00	850.00	975.00	1025.00	52.85	NS
Slaughter weight	675.00	727.50	800.00	920.00	967.50	51.02	NS
Carcass weight	395.50	412.75	455.40	560.70	594.75	41.02	NS
Dressing %	55.98	53.28	53.89	57.34	57.70	3.00	NS
Legs	2.67	3.28	2.55	2.85	2.78	0.14	NS
Head	9.45	8.74	8.30	8.45	8.26	0.29	NS
Kidney	0.58	0.78	0.63	0.59	0.53	0.05	NS
Small intestine	5.68	5.27	4.28	5.72	6.63	1.01	NS
Large intestine	0.43	0.32	0.48	0.44	0.47	0.06	NS
Heart	0.17	0.22	0.21	0.17	0.17	0.02	NS
Lungs	0.37	0.44	0.39	0.59	0.44	0.06	NS
Spleen	0.05	0.45	0.3	0.35	0.35	0.01	NS
Liver	2.03	2.22	2.21	2.25	1.87	0.2	NS
Stomach	5.52	5.93	5.27	4.43	5.36	0.5	NS
Caeca	7.49	9.77	8.33	8.57	6.33	0.67	NS
Tail	0.41	0.50	0.37	0.47	0.47	0.02	NS
Skin	5.69	5.01	5.88	5.79	6.29	0.47	NS

LS= Level of Significance; NS= Not significant; SEM= Standard Error of Means

The Live weight of rabbits presented in Table 4. There were no significant differences observed between dietary treatments in live weight. The live weight ranged from 710.00g – 1025.00g with diet D (30% PKC) recording highest and diet A recording the lowest. There were also no significant differences among the dietary treatments in slaughter weight which ranged from 675.00g – 967.50g for diet A and E respectively. Furthermore, no significant differences were also observed among the dietary treatments in carcass weight which ranged from 395.00g – 594.25g for diet A and E respectively. Diet E (40% PKC) recorded the highest dressing

percentage (57.70%), followed by diet D (57.34%), diet A (55.98%), diet C (53.89%), and diet B (53.28%). The legs weight ranged from 2.67% - 2.78%. Diet A (0% PKC) recorded the highest head weight and ranged from 9.45% – 8.26%. Diet C (20% PKC) recorded the highest kidney weight among treatments which ranged from 0.58% - 0.53%. Diet D (30% PKC) recorded the highest lungs weight among treatments which ranged from 0.37% – 0.44%. Diet E (40% PKC) recorded the highest small intestine weight (6.63%) and large intestine weights (0.47%). On the other hand, diet B (10% PKC) had the highest (0.22%) heart weight while rabbits

on diet A (0% PKC) had the highest spleen weight. Furthermore, Diet D (30% PKC) had the highest (2.22%) liver weight, while the lowest (91.87%) was recorded for diet E (40% PKC). Diet B also recorded highest weights for stomach caeca and tail (5.93, 9.77 and 0.50 respectively) while the highest value for skin was recorded for diet C (5.88%).

Discussion

Performance

The non-significant effect of PKC on final weight observed in this study agree with the findings of Aduku *et al.* (1988) who reported that palm kernel meal compared favourably with peanut in the diets of weaned rabbits without significant differences in the final live weight. However, Imasuen *et al.* (2003) reported significant effect of palm kernel meal on final live weight of weaned rabbits. Ezieshi and Olomo (2004) also reported a similar trend in broilers. The average daily feed intake did not differ significantly among the treatment means. This also confirms the report of Aduku *et al.* (1988); Loh *et al.* (2002) and Ezieshi and Olomo (2004). Also, there were no significant differences in the total weight gain, weekly weight gain, and daily weight gain between diets containing PKC and control diet. This agrees with the findings of Garcia *et al.* (1999) who observed a decrease in body weight gain as the palm kernel meal increases up to 40%. Osei and Amo (1987) also reported a similar trend in broilers. There is a linear increase in the total weight gain, and the average daily weight gain as the level of PKC in the diet increases up to 40% level of inclusion, in other words, rabbits on PKC diet recorded better weight gain than rabbits on wheat offal diets. The non-significant effect of PKC in diets agree with the findings of Garcia *et al.* (1999), who reported that feed conversion ratio was

not significantly different between the control diet and palm kernel meal based in chicks.

Carcass characteristics

For carcass analysis, the higher live weight, slaughter weight, and carcass weight of rabbits fed diet E (40% PKM) correspond to the result on final live weight of the animals. This result on contradicts earlier reports by Garcia *et al.* (1999), who reported that carcass weight was reduced by additional levels of palm kernel cake in broiler diets. The dressing percentage of rabbits compared favorably with rabbits on the control diet. This contradicts the findings of Rhule (1996) who reported that dressing percentage was significantly affected by the level of palm kernel cake in the diets of pigs. The weight of other organs such as head, legs, kidney, heart, liver and spleen did not show significant differences across the dietary treatments. This does not correspond to Orunmuyi *et al.* (2006) result, who observed differences in liver, lungs, kidneys, and intestines.

Conclusion

The study showed that palm kernel cake can be used to replace wheat offal in diets of weaned rabbits with tremendous cost savings, especially when wheat offal is expensive and/or limited in supply. Based on the study, it is therefore recommended that palm kernel cake can be included in the diet of weaned rabbits up to 40% level of inclusion without any effect on the performance, and carcass characteristics.

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