Growth Response of Grower Rabbits (*Oryctolagus Cunniculus*) Fed Diets Containing Graded Levels of Anaerobically Fermented Cassava/Palm Kernel Meals

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***Abstract*: The study was conducted to evaluate the growth response of Rabbits (*Oryctolagus cuniculus*) fed diets containing varying levels of fermented cassava/ palm kernel meal. 80 grower Rabbits of a New Zealand white x dutch breed with average weight of 600g were assigned to five dietary treatment in a completely randomised design.**

The rabbits were of 5 groups of 16 rabbits; each replicate four times i.e. 4 rabbits per replicate and reared in indoor hutch of 1m x 1m x 0.6m for 56 days. Soyabean meal as a major protein source was gradually replaced in the diet with fermented cassava/palm kernel meal at 0%, 10%, 20%, 30%, and 40% respectively. In the control diet, there was no cassava/ palm kernel meal. Rabbit were fed ad-libtum for 56 days. The growth response and nutrient utilization were evaluated base on feed conversion ration (FCR), protein efficiency ration (PER), and specific growth rate (SGR) as parameters. The highest feed conversion ratio of 6.39 was obtained from test diet 5 (40%) while the least value of 4.1 was obtained from the control group, indicating that feed was better utilized by the rabbit fed the control diet (p<0.05). The least value for specific growth rate (0.54) was obtained from the Diets 5 (40%), while the value of 1.04 was recorded from control group (p<0.05). This research shows that fermented cassava/palm kernel meal can be included up to 20 % in ration of grower rabbit (*Oryctolagus cuniculus*), without negative effect on growth performance.

Keywords: **Anaerobic, Cassava/palm kernel meal, Diets, Growth, Rabbit.**

I. INTRODUCTION

Rabbit has been described as a good source of lean, healthy meat with good protein to maintain health and rapid healing after injury and illness.(Agbabiaka and Ayo-enwerem, 2014).Rabbits are prolific breeders, producing large quantity of tasty meat for home consumption. Their rate of prolificacy is faster than that of pig, sheep, and goat.

Rabbits grow rapidly because they are efficient at converting food into meat. A bunny weighs about 51g when born. In 6 days its weight will have increased eight fold or more (Adjare, 1993). Just like humans rabbits need variety in their diet, and grass or green leave may not be enough for lactating and growing animals. Neither humans nor rabbits can work and/or reproduce well if they only eat vegetables without grains or other starchy foods like tubers. (Schlere and corstigensen, 2000). Although a lot of researches has been carried out on the utilization of cassava and palm kernel cake in animal agriculture, (Ezieshi and olomu 2007, Ofojekwu *et al*., 2003; Chin, 2002). Research on their utilization in rabbit nutrition is scanty. Some works, among a few others, available include (Modupe *et al*., 2008) (Olorunsanya *et al*., 2007). Effort has been made to provide a standard for the nutritional component of some locally available feedstuffs used in the Nigerian livestock industry. (Okata *et al*., 2018) and (Aduku, 1993).

This research therefore aims at extending research on cassava and palm kernel cake to the area of rabbit nutrition, considering the availability of these raw materials in Nigeria and the prolificacy and importance of rabbit as a source of high quality animal protein for teaming human population of the developing countries. The major challenge in this regards is formulating diet that contain these feed stuff in appropriate ratio without compromising the nutritional need of the animal (Uchegbu *et al*., 2009). This research therefore was aimed at accessing the optimum inclusion rate of composite cassava/palm kernel cake meal that will optimize growth performance of grower rabbits.

II. MATERIALS AND METHODS

Description of study area: This research was carried out in the livestock section of the Teaching and Research Farm of the Federal Polytechnic Ile-Oluji (Fedpolel), Ondo State Nigeria. Ile- Oluji has a tropical climate and lies between longitude 6° 40´ N and 7° 14´ N and latitude 4° 38´ E and 4° 53´ E. It is 243m above sea level and has annual mean precipitation of 1477mm and annual mean temperature 26.1°c (Federal Ministry of Aviation 2001).

Source and processing of experimental materials: The cassava used in this project was purchased from open market in Ile – Oluji, Ile –Oluji /Oke -Igbo local government. While the palm kernel cake as well as other conventional feed ingredients such as wheat offal, Soya bean meal, bone meal, vitamin premix, salt etc. were purchased from animal concept feed Feed mill Akure, Ondo State, Nigeria. The mixture of cassava/palm kernel meal (60:40) was subjected to 7 days of anaerobic fermentation which at the end was sun dried and milled.

Experimental diet **:** Five diets Isonitrogenious (15-16% c.p) Isocaloric 2400kcal/metabolizable energy/kg were formulated such that dried composite cassava/palm kernel meal was included at 0%, 10%, 20%, 30% and 40% [Table 1]. Other feed ingredients were the same for all the diets. Measured quantity of the rations were fed ad-libitum to the animals for a period of 56 days. Left over feeds were recovered and weighed every morning throughout the duration of the research. The diets were analysed for proximate composition using the procedure of (AOAC, 1995).

Experimental rabbits and design: 80 female grower of New Zealand white X Dutch breed (average weight of 600g and 8 weeks old) were selected from the Teaching and Research farm of the Federal Polytechnic Ile-Oluji, Ondo State. The rabbit were randomly assigned to each of the five diets in a completely randomized design (4 rabbits per replicate and 4 replicates per treatment). During the experimental period, routine management practices were maintained.

Data collection: Feed and water were offered ad-libitum. The experiment lasted for eight weeks. Each rabbit was weighed prior to the commencement of the feed trial, followed by weekly weighing of the rabbits. Feed consumed by each group was recorded daily. The rabbits were starved 24 house prior to the commencement of the trial.

Chemical analysis : Crude protein, moisture content, ether extract, fibre content, Nitrogen free extract were determined according to the procedures of the association of official analytical chemists. The ash content was determined by ashing sample in electric furnance (Blue m electric co. usa) at 550°c for 6 hours.

*Statistical evaluation***:** Data collected was subjected to one way analysis of variance as described by snedecor and cochran (1980) and where significant difference is indicated, such mean was separated using Duncans multiple range test as described by Obi,(1990)

TABLE 1**:** Composition of Experimental Diet fed to (*Oryctolagus cuniculus*)

Dietary Inclusion (%)

INGREDIENT	0	10	20	30	40
Rice bran	38.95	29.95	22.95	17.85	10.95
Soyabean cake	18	17	14	9	6
Wheat offal	10	10	10	10	10
Cassava/pkc	0	10	20	30	40
Palm oil	5	5	5	5	5
Maize	20	20	20	20	20
Cassava peal	4.4	4.4	4.4	4.4	4.4
Bone meal	2	2	2	2	2
Vitamin/mineral premix	0.25	0.25	0.25	0.25	0.25
Lysine	0.5	0.5	0.5	0.5	0.5
Methionine	0.65	0.65	0.65	0.65	0.65
Nacl	0.25	0.25	0.25	0.25	0.25
Crude protein	16.85	16.19	16.19	15.76	15.96
Crude fibre	9.20	7.90	7.38	6.89	6.40
ME/Kcal/kg	2401	2441.96	2466.16	2489	2451

ME: Metabolisable Energy

Biological Evaluation:

a) Mean weight gain (MWG) = Final weight- Initial weight

b) Specific Growth Rate (%day¯¯1)

$$= \frac{\log \text{ of final Weight} - \log \text{ of initial weight} \times 100}{\text{Period (days)}} \quad 1$$

c) Feed Conversion ration (FCR) = $\frac{\text{Feed eaten (g)}}{\text{weight gain (g)}}$

d) Protein Efficiency Ratio (PER) = $\frac{\text{Weight gain}}{\text{protein intake}}$

e) Mean Growth Rate (MGR) = $\frac{\text{Weight gain (g)}}{\text{Time (days)}}$

f) Protein intake = Total feed intake x % Crude protein in the diet.

IV. RESULT AND DISCUSSION:

Nutrient essay of test ingredient (fermented cassava/palm kernel meal): The result of the proximate analysis of the test sample showed that it contains 21.92% crude protein, 6.00% crude fibre, 11.55% moisture content 1.55% Ash and 48.49 nitrogen free extract respectively (Table 2.)

Feed intake: The overall feed intake of the experimental rabbit (*Oryctolagus cunniculus)* were 7000g, 6832g, 6770g, 5040g, and 3920g for 0%, 10%, 20%, 30%, 40% respectively.

There were no significant difference between the control group and the group fed 10% and 20% cassava/palm kernel meal based diet. However, there was a significant difference ($p<0.05$) between the control group and the groups fed 30% and 40% cassava/palm kernel based diet.

Feed conversion ratio : The values obtained for feed conversion of the experimental rabbits (*Oryctolagus cunniculus*) were 4.1, 4.19, 4.46, 5.60, 6.39 for 0%, 10%, 20%, 30% , and 40% respectively.The control group (4.1) had the best feed conversion ratio while the group fed 40% cassava/palm kernel cake based diet recorded the least value of 6.39. There was a significant difference ($p<0.05$) between the control group, and the group fed beyond 20% of cassava/palm kernel cake diet.

Specific growth rate (SGR % day) : The highest value of 1.04 was recorded from rabbits (Oryctolagus cunniculus) fed with 0% cassava/palm kernel cake based diet (control diet), while the least value of 0.54 was recorded from the group fed 40%

cassava/palm kernel meal based diet. However diets with 10%, 20% were significantly difference (p<0.05) from diet containg 30% and 40% inclusion rate of cassava/palm kernel cake based diet.

Mean growth rate (MGR) : The mean growth rate of rabbits (Oryctolagus cunniculus) were 30.48g, 29.05g, 27g, 16g, and 10g, for 0%, 10%, 20%, 30% , and 40% respectively.

There were significant difference (P<0.05) between the control group 0% and the groups fed 30% and 40% of the cassava/palm kernel cake base diet. But there was no significant difference between the control group and the group feed 10% and 20% of the cassava/palm kernel cake based diet.

Specific growth rate : The highest value of 1.04 was recorded on rabbits (Oryctolagus cunniculus) fed 0% (Control diet),while the least value of 0.97 was recorded from rabbits group fed 40% cassava/palm kernel meal based diet. Though diet with 0% and 10% inclusion were significantly difference (P<0.05) from diet with 30% and 40% inclusion, They are however similar to 20% inclusion.

Weight gain: There were no significant difference among the control group (10%) and the groups fed 10% and 20% of the cassava/palm kernel cake based diets. But there was significant difference (P<0.05) between the control group (0%), 10%, 20% and the group fed 30% and 40% cassava/palm kernel cake base diet. The mean weight gain of the rabbits (Oryctolagus cunniculus) were 1707g, 1627g, 1515g, 899g, 613g for dietary treatment 0%, 10%, 20%, 30%, and 40% respectively (Table 3).

There were very slight reductions in the value of crude protein as the dietary inclusion of cassava/palm kernel cake meal increased comparatively, perhaps due to superior crude protein of soybean meal. (Aduku, 1993 and Eyo, 2001 and Okata *et al.*, 2018).

Generally, there was an increase in the body weight of the experimental animals among all treatments. This is an indication that the diets were adequate in protein, energy and other nutritional requirements for rabbit growers. Similar result was obtained when cassava/palm kernel cake based diet were fed to Nile Tilapia (*Oreochromis niloticus L.*) (Agbabiaka C.N and Osigwe D.I. 2014).

The highest feed intake of 6999g was recorded in the control diet (0%). While the least feed intake value of 3920g was recorded from the group fed 40% of the cassava/palm kernel based diets. This result is similar to (Modupe *et al*., 2006) in which palm kernel cake was included to feed of rabbit up to 30% without negative effect on growth performance. There appears to be a decrease in the performance of grower rabbit as the inclusion levels of fermented cassava/palm kernel cake increases in the ration beyond 20%. Perhaps this might be as a result of decrease level of crude fibre in the ration as more fermented cassava/palm kernel meal are added to the ration. Similar result were obtained by (Bi Yu and Peter W.S., 1996) in which body weight gain and feed intake were observed to be significantly increased as the level of dietary fibre increases from 5.5% to 14.5%. In a similar research, (Abd El –baki *et al*., 1993) observed that feed intake of grower rabbits were lower with inclusion of complete cassava feed (CCF) than with commercial feed (AF diet; Atmida) during the first five weeks (1st stage) after weaning.

Again, reduction in the feed intake and nutrient utilization as cassava/palm kernel meal increased in the diet might be attributed to presence of anti nutritional factor in the cassava/palm kernel such as phytate, phenol and tanine, originating from cassava, which are known to be bitter and causes a lower feed intake in non-ruminants animals. (Zein *et al.*, 2008).

The feed conversion ratio of the experimental diets indicates that cassava/palm kernel cake at 10% and 20% percent were better utilized by the grower rabbits. The highest value of mean weight gain (1707g) was obtained from the control group while the least value of (613g) was recorded from the group fed 40% cassava/palm kernel meal based diet. There was significant difference (P<0.05) among the control group, (0%), the group fed 10%, the group fed 20% diets and the groups fed diets containing cassava/palm kernel meal above 20%.

Table (2): proximate composition of the composite test ingredients

Parameter	Concentration (%)
Moisture	12.55
Crude Fiber	6.00
Crude protein	22.42
Ether Extract	12.00
Ash	1.55
NFE	48.49

NFE = Nitrogen Free Extracts.

Table (3): Growth performance of Rabbit (*Oryctolagus cuniculus*) fed an aerobically fermented cassava/palm kernel meal

Parameter	Dietary treatments					
	0%	10%	20%	30%	40%	SEM
Initial weight of rabbit (g)	602	601	600	601	605	0.77
Final weight of rabbit (g)	2309	2228	115	1500	1218	193.86
Mean weight gain (g)	1707a	1627a	1515a	899b	613b	194.36
Total feed intake (g)	7000a	6832a	6770a	5040b	3920b	546.57
Feed conversion Ratio	4.1a	4.19a	4.46a	5.60b	6.39b	0.40
Protein efficiency"	1.48a	1.41a	1.38a	1.10b	0.98b	0.08
Mean growth rate (g)	30.48a	29.05a	27a	16b	10b	3.60
Specific growth rate (% per day)	1.04a	1.02a	0.98a	0.71b	0.54b	0.09

a,b,c Means of rows with same superscript are not significantly different (P<0.05), SEM = Standard error mean.

V. CONCLUSION

The result from this study showed that fermented cassava/palm kernel meal can be incorporated in the diet of rabbit (*Oryctolagus cunniculus*) growers up to 20% dietary level as shown in the value obtained from mean weight gain and specific growth rate without compromising performance ($P<0.05$). This will invariably lead to reduction in rabbit feed cost, if implemented.

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