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Assessment of Cassava Peels and Palm Kernel Cake (Pkc) on the Performance of Grower Pigs

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ABSTRACT

The research was carried out for a period of ten (10) weeks at the piggery unit of the teaching and research farm of the Faculty of Agriculture, Ambrose Alli University, Ekpoma, Edo State, Nigeria. The objective of this study was to assess the effect of cassava peels and palm kernel cake (PKC) at 50:50 ratio on the performance of grower pigs. The performance of grower pigs were determined using fourty (40) weaner pigs of large white, pigs were divided into 5 groups based on average initial weight (8.88 to 9.32kg) and each group of grower pigs were respectively allocated to each of the five treatment diets in a completely randomized design (CRD). During the feeding trial, weekly feed consumption and weight changes were recorded for all the levels, while weight gain, feed conversion ratio and protein efficiency ratio were estimated to assess performance of the weaner pigs. The results from the study shows significant ($p<0.05$) differences on the performance characteristics of weaner pigs, while animals on 25% diet gave the best compared to other diets in final weight gain, feed conversion ratio and protein efficiency ratio (25.67kg, 2.06 and 2.52) respectively. However, the dietary inclusion of cassava peels/pkc diets in the weaner pigs as alternative energy source on the gross profits per pig(N), pigs on 25% yielded the highest profit of N2191.30 and has proved as the most efficient and cost effective ration in weaner pigs.

Keywords: *Weaner pigs, Growth performance, cost benefits, Cassava peels and palm kernel cake.*

INTRODUCTION

In the world's widening search for cheap sources of energy or protein-rich foods, increasing attention has been focused on home-grown under-exploited crops whose products and by-products contain relatively high amounts of energy or protein that can be used to improve the diets of vast majority of populace. Africa is currently plagued with food crisis, due to partly unprecedented rise in human population and alarming drop in per capital food production in the last decades. Our inability to produce more food to feed ourselves, and bring down the rising prices of foodstuffs in the market has compounded the poverty level of Nigerians, as reflected in the deterioration of the quality and quantity of their animal protein intake. Nigeria is richly endowed with a variety of animal protein sources; 19 million cattle, 72.5 million goats, 41.3 million sheep, 7.1 million pigs, 145 million poultry, 11.6 million ducks 2.1 million turkey, donkeys etc (FMARD, 2011., Oboh, 2016). According to Egbunike (1997), Nigeria still remains the least consumer of animal protein compared to North America, Western and Eastern Europe whose animal protein intake per day is 66, 53 and 39 grammes respectively. Also, Acholonu (1996) stated per caput poultry meat consumption in USA, Malaysia, Brazil, South Africa, Indonesia, China and Nigeria as 38, 22, 19, 18, 4.8, 4.8 and 2.2g respectively. It was reported by FAO, (2004) that there is greater output of meat from pigs which is 63.9 million metric tones per year than combined output of meat from cattle, buffalo, sheep and goats that gives 58.9million metric tones per year. Nigeria has not been able to meet the animal protein requirement in sufficient quantity for her citizenry (Ibe, 2004). Tewe (1997) stated that daily intake of animal protein in Nigeria average 4.82g per head in contrast to 35g recommended for proper growth, reproduction, lactation, health and survival, while Ibe (2004) added that many Nigerians consume less than l0g of animal protein daily as against the minimum of 28g/caput/day considered consistent with a balance diet. Moreso, FAO (2004) estimated about 89.5g of protein essential for

normal functioning of the body on a daily basis of which 34g be obtained from animal. It is noteworthy that meat consumption is often an indication of economic status of a country or individual (Ososanya , 2004). In classification of countries, as either developed or developing, two major criteria are often used: per capital income and per caput animal protein consumption. The existing acute shortage of protein in Nigeria associated with its high cost of procurement by the majority necessitates effort in livestock production using agricultural crops and their by-products such as cassava, yam, sweet potatoes, maize, wheat, rice, groundnut, soya bean and their products that are not utilized by humans for feed, in attempt to reduce cost.

MATERIALS AND METHODS

The research was carried out at the piggery unit of the teaching and research farm of the Faculty of Agriculture, Ambrose Alli University, Ekpoma. The farm is located in Esan West Local Government Area Council of Edo State, Nigeria; with an annual rainfall of 1500-2000mm per annual. Relative humidity is 75% and average temperature is 320C. The research was carried out for a period of ten weeks. A total of 40 grower pigs of large white were used for the study. The pigs were divided into 5 groups based on average initial weights (20-25kg) and each group of grower pigs were respectively allocated to each of the five treatment diets in a completely randomized design (CRD). Each treatment group contained 2 replicates of 4 pigs (2male and 2female). These pigs were fed twice daily and water supplied adlibitium.

The treatment diets consisted of the following of cassava peels/Pkc at 0, 25, 50, 75 and 100% replacement of maize in the control diet were formulated. The 50:50 ratio of cassava peels and palm kernel cake was derived by equal weighing (kg) of the two test ingredients percentage in the diet using a manual scale, all diets were formulated to be iso-nitrogenous and iso-caloric.

During the feeding trial, weekly feed consumption and weight changes were recorded, while weight gain, feed conversion ratio and protein efficiency ratio were estimated to assess performance of the grower pigs. The data collected on various parameters were analyzed using FAO (2002) package and difference in treatment means were separated using Duncan's New multiple range test as outlined by Obi (2002).

The formula for calculating the different parameters were:

Feed intake = feed given - left over

$$\text{Feed conversion ratio} = \frac{\text{Feed consumed (kg)}}{\text{Weight gain}}$$

Weight gain = Final weight - initial weight

$$\text{Protein efficiency ratio} = \frac{\text{Gain in weight}}{\text{Protein consumed.}}$$

Table1. *Composition of experimental diet for weaners pig*

Ingredients	0	25%	50%	75%	100%
Maize	55.00	41.25	27.50	13.75	-
Cassava peels/PKC	-	13.75	27.50	41.25	55.00
Ground Nut Cake	25.60	26.78	27.92	29.06	30.21
Wheat Offal	14.10	12.72	11.51	10.26	9.02
Bone Meal	1.50	1.50	1.50	1.50	1.50
Limestone	2.00	2.00	2.00	2.00	2.00
Palm Oil	1.00	2.00	2.20	2.40	2.60
Weaner Premix*	0.25	0.25	0.25	0.25	0.25
Salt	0.35	0.35	0.35	0.35	0.35
Ronozyme**	0.20	0.20	0.20	0.20	0.20
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
Calculated Analysis:					
Crude Protein (%)	**19.00**	**19.00**	**19.00**	**19.00**	**19.00**
ME(Keal/Kg)	**2878**	**2857**	**2835**	**2813**	**2791**
Fibre (%)	5.35	6.99	8.63	10.26	11.90
Ash (%)	5.94	9.11	12.34	15.57	18.80
Calcium (%)	0.80	0.80	0.80	0.80	0.80
Starch (%)	39.20	36.14	32.99	29.85	26.70
Fat (%)	6.48	7.74	8.99	10.25	11.50

** Grower Premix supplied the following per kg diet: Vit A 10,000,000 IU; Vit D32,000,000IU; Vit E 8,000 IU; Vit K 2,000mg;Vit B12,000 mg; Vit B25,500mg; Vit B61,200 mg; Vit B12 12 mg; Biotin30mg; Folic Acid 600*

mg; Niacin 10,000 mg; Pantothenic Acid 7,000mg; Choline chloride 500,000 mg; Vit C 10,000mg; Iron 60,000 mg; Mn 80,000 mg; Cu 8,00mg; Zn 50,000 mg; Iodine 2,000 mg; Cobal 450 mg; Selenium 100 mg; Mg 100,000 mg; Anti Oxidant 6,000 mg; PKC – Palm Kernel Cake, GNC = Groundnut cake, C.P. = Crude protein, ME = Metabolizable energy.

***Ronozyme Composition of the product, sodium sulfate (52.7%), calcium carbonate (15%), kaolin (9%), dextrin and sucrose (8%), cellulose (6%) and vegetable oil (7%). bulk density of 1,100 kg/m3. The particle size distribution of the product showed that 98% of the particles are between 150 and 1,200 μm in diameter and less than 1% of particles are below 150 μm.*

Performance Characteristics of Weaner Pigs Fed Experimental Diets

Initial live weight of weaner pigs ranged from 8.88kg to 9.32kg, average final weight gain of the weaner pigs obtained are shown in table 7 revealed that, experimental animals were significantly (P<0.05) affected by the experimental diets. Animal fed 25% inclusion of cassava peels/Pkc meal gave the highest final weight (25.67kg), followed by control (23.84kg), and while values obtained for 50, 75 and 100% experimental diets decreased with increased replacement levels of cassava peels/Pkc meal. However, similar significant (P<0.05) differences were recorded in average total weight gain and weekly weight gain of weaner pigs fed experimental diets that ranged from 25(2.40) to 100%(1.69kg) respectively. Feed intake values were not significantly affected at weaner phase; results were the same across the groups.

Feed conversion ratio differed significantly (P<0.05) in the experimental animals, while animals on 25% (2.06) diet gave the best compared to other diets with corresponding values of 0(2.41), 50(2.69), 75(2.80) and 100% (2.96) respectively. Protein efficiency ratio of weaner pigs was significantly (P<0.05) influenced by the experimental diets, highest value was recorded in 25 %(2.52) diet, followed by control (2.18), 50(1.95), 75(1.88) and 100 %(1.78) in that order. There was no mortality throughout this phase of feeding trial.

Table2. *Performance characteristics of weaner pigs fed experimental diets*

	Levels of Inclusion (%)					
	0	**25**	**50**	**75**	**100**	
Parameters	**1**	**2**	**3**	**4**	**5**	**SEM (±)**
Ave. initial wght(kg)	9.32	8.88	9.00	9.00	9.00	
Ave. final wght(kg)	23.84^{b}	25.67^{a}	22.00^{c}	21.50^{d}	20.84^{d}	0.46
Ave. total wght gain(kg)	14.52^{b}	16.79^{a}	13.00^{d}	12.50^{cd}	11.84^{d}	0.44
Ave. weekly wght gain(kg)	2.07^{b}	2.40^{a}	1.86^{c}	1.78^{cd}	1.69^{d}	0.64
Feed intake(kg)	35.00	35.00	35.00	35.00	35.00	0.01
Feed conversion ratio	2.41^{c}	2.06^{d}	2.69^{b}	2.80^{b}	2.96^{a}	0.68
Protein efficiency ratio	2.18^{b}	2.52^{a}	1.95^{c}	1.88^{cd}	1.78^{d}	0.08
Mortality (%)	-	-	-	-	-	-

a , b, c, d, e means along the same row with different superscripts are significantly (p< 0.05) different from each ot her, Ave: Average, SEM: Standard error of mean.

Economics and Efficiency of Weaner Pigs Fed Experimental Diets

Economics and efficiency of experimental diets are shown in table 8. Feed cost (N/kg) was higher in diet containing maize, followed by diet 2, 3, 4 and 5 with corresponding values of N99.91, N 90.90, N79.86, N66.40 and N56.50 respectively. total cost of feed per weight gain per pig were N3496.75, N3181.50, N2795.40, N2325.40 and N1977.50 for diet 1, 2, 3, 4 and 5, figures shows that maize based diet was the Highest, followed by diet 2, 3, 4, and 5 in that order. This could be traceable to high cost of maize as a major source of energy in the diet. Revenue/total live weight gain/pig (N) ranged from N5372.80 in diet 2 to N3788.80 in diet 5. Highest revenue was obtained in diet 2 with 25% inclusion of experimental diet as the alternative energy source, also on the gross profit/pig (N), pigs in diet 2 yielded highest and profit were N2191.30, N1811.30, N1674.90, N1364.60 and N1149.55 for diet 2, 5, 4, 3 and 1 respectively.

Table3. *Economics and efficiency of weaner pigs fed experimental diets*

	Levels of Inclusion (%)				
	0	**25**	**50**	**75**	**100**
Parameters	**1**	**2**	**3**	**4**	**5**
Ave. initial wght/pig (kg)	9.32	8.88	9.00	9.00	9.00

Ave. final wght/pig (kg)	23.84	25.67	22.00	21.50	20.84
Ave. total wght gain/pig (kg)	14.52	16.79	13.00	12.50	11.84
Feed cost (₦ /kg)	99.91	90.90	79.86	66.44	56.50
Total feed consumed/pig (kg)	35.00	35.00	35.00	35.00	35.00
Total cost of feed/pig (₦) live wght gain	3496.75	3181.50	2795.40	2325.40	1977.50
Revenue/total live wght gain/pig (₦)	4646.40	5372.80	4160.00	4000.00	3788.80
Gross profit/pig (₦)	1149.55	2191.30	1364.60	1674.90	1811.30

Ave: Average.

Performance Characteristics of Weaner Pigs Fed Experimental Diets

The effect of feeding cassava peels/PKC meal on the Performance characteristics such as average final weight, average total weight gain, average weekly weight gain, feed conversion ratio and protein efficiency experienced a gradual falls in values as the levels of cassava peels/pkc meal increased and this fall was critical at complete replacement of maize with cassava peels/Pkc at 100%. However, the study is in agreement with Igene (2006) who observed that the uses of cassava in feeding pigs at level higher than 50% usually resulted to decrease in both live weight and feed conversion efficiency. Also Amae fuel et al. (2006) and Ekenyem (2007) posited that inclusion of cassava peels above 60% will also has a deleterious effect on the performance of weaner pigs. The decreased in average weekly body weight gain with increased levels of cassava peels/pkc in the diets is attributed to the tendency of cassava peels/pkc in pig diets to decrease the level of fat layed down in the tissues. The poor results noticed with high cassava peels/pkc meal in the diet is also ascribed to the techniques of processing cassava peels/pkc meal, which is in accordance with Ubalua (2007) who reported that digestive disturbance have been frequently noticed when large amount of cassava peels is fed to certain animals due to the presence of cyanogenic potential and high variable fiber contents in cassava peels which increased the osmosis pressure in the gastro-intestinal trait and subsequently cause digestion disturbance. This situation could cause the decreased in feed intake with the increased levels of cassava peels/pkc meal in the diets, as a result of high dehydration and increase salivation in the weaners, resulting in a decreased body weight. Also the dustiness of cassava peels/pkc ration has contributed to the decrease in feed intake as a result of nasal disorder caused by high levels of cassava peels in the diet. Higher inclusion of the by-product in monogastric feeding or formulation of diets with cassava peels, as sole energy source is therefore limited because of its fibrous nature. Feed efficiency was found to increase with increased levels of cassava peels/pkc in the diet indicating a lower efficiency of utilization of cassava peels/pkc diet by the weaner pigs in this study. This is in accordance with work of Bimrew (2014) who showed that early weaned pigs have limited amylase, protease, lipase activity and enhancement of the extent of digestion of nutrients would improve performance and reduce the incidence of the diarrhea that results from undigested nutrients reaching the gut fermented by bacteria.

Economics and Efficiency of Weaner Pigs Fed Experimental Diets.

Economics and efficiency of weaner pigs fed experimental diets assessed by feed cost (N/kg), total cost of feed consumed (N/kg), and cost of feed per pig(kg) decreased as the levels of inclusion of cassava peels/pkc meal in the diets increased. Profit/pig (N) revealed that 25% diet was the most cost effective for producing weaner pigs. Feed cost/kg was least in 100 %(N56.50) and highest (N99.91) in control diet . Similarly, total cost of feed consumed per pig was least (N1977.50) in 100% cassava peels/pkc diet and highest in maize (N3496.75) based diet, is credited to the high cost of maize during the experimental trial. This is in agreement with earlier reports by Balogun et al. (1997), Irekhore et al. (2006) and Adesehinwa et al. (2011) that cassava peels introduced up to 30% in piglet diets had no effect on growth rate and in pigs above 35kg weight, that feeding up to 57% inclusion was adequate for replacement for maize in young pig diets has showed to be cost effective. Low cost of feed/kg live weight gain in pigs observed in 25% diet translated to more revenue and profit. Thus, 25% diet was the most efficient and cost effective. This profit derived from 25% diet was almost twice the one of maize. Also of interest is the fact that other substitutes at 50, 75 and 100% were more profitable than maize based diet.

Oboh (2016) reported that replacement of cassava peel for maize up to 50% level in a weaner pigs diet resulted to higher revenue and profit. However, Oboh et al. (2014) also

reported that replacement of whole maize with maize offal's with brewers dried yeast mixture up to 50% level resulted to higher profit. Damisa et al. (2009) further stressed that the inclusion of cassava peels meal up to 38% with 5-4% palm oil, gave a better economic performance than other combination of peels and palm oil. This study confirmed that cassava peels/pkc meal at 25% as energy source is the most cost effective ingredients for ration formulation in weaners. The result of the study is in conformity with reports of earlier authors and has justified the need for continuous search for alternative feed ingredients to replace the costlier conventional ingredients.

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