



**Effect of Cassava Peels and Palm Kernel Cake Meal Mixtures on the Carcass Characteristics and Relative Organs Weight of Finisher Pigs.**

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**Abstract**

*The research was carried out for a period of twenty two (22) 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) mixture at 1:1 ratio on the carcass characteristics and relative organs weight of finisher pigs. Forty (40) finisher pigs of large white breed were used for the study. Each group of finisher pigs contained eight pigs per treatment, were respectively allocated to five treatment diets in a completely randomized design (CRD). At the end of the twenty two (22) weeks feeding trial, ten pigs consisting of two pigs (male and female) per treatment were randomly selected for slaughter and analyzed for carcass characteristics, cut-up parts and relative organ weight. Carcass characteristics parameters recorded, apart from fat free index, were depressed with increased levels of cassava peels/pkc meal mixtures. Pigs fed control and 25% diet were significantly ( $P < 0.05$ ) higher in Carcass characteristics which include bled weight, fasted weight, dressing percentage, carcass weight, back fat, cut-up parts with relative organs weight were negatively affected as the inclusion levels amplified. However, 25% treatment carcass characteristic parameters of cassava peels and palm kernel mixtures compete favourably with the control compared to other treatments and is therefore recommended.*

**Keywords:** cassava peels, palm kernel cake, Carcass characteristics, relative organs weight, finisher pigs.

**Introduction**

Conventional crops particularly maize in the developing countries is not sufficient to cater for the growing demand of food, feed and industrial uses. Identifying alternate feed resources as a substitute for maize would reduce feed costs and spare maize for food, industrial uses and for feeding poultry, where maize is indispensable. It has been established that pig performance in terms of weight and efficiency of gain and carcass leanness is clearly related to the intake/nutrients levels, particularly energy and protein. However, the major feed ingredients used in pig ration formulation such as maize, soya bean meal and groundnut cake have continued to be limited and costly due mainly to their squat production and rivalry as food for human beings in Nigeria. This has caused the crumple of many small and large scale pig enterprises,

discouraging potential farmers and curtailing further expansion of small backyard piggeries. Nevertheless, the exploration of many industrial by-product such as cassava peels, palm kernel meal, brewers dried grains and wheat offal among others, to serve as cheaper substitute which are readily available nutrient sources for pigs has been acknowledged but not fully harnessed (Nwakpu *et al.*, 1999; Oboh, 2016). It is in realization of the above intention coupled with the increased capital and foreign exchange rate that farmers and feed manufacturers are now facing on the operations that have led towards greater reliance on locally available feed stuffs (Bratte *et al.*, 2011). It is not likely that, there would be a decrease in such competition even in this 21<sup>st</sup> century. Recently, more Nigerian have realized the potentials of pig as quick source of animal protein having the following attributes;

high litter size, short generation interval, high growth rate, high prolificacy, ability to convert kitchen waste into nutritious meat. There is therefore every need to find ways of utilizing some of the domestic wastes like cassava peels and palm kernel cake in formulating swine diets (Oke, 1978; Marire *et al.*, 1997; Sriroth *et al.*, 2000; Sundu *et al.*, 2006). This study therefore, evaluated the effect of cassava peels and palm kernel cake mixtures on the carcass characteristics and relative organs weight of finisher pigs.

## Materials and Methods

### Experimental Site

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; which is characterized by an annual rainfall of 1500-2000mm per annum. Relative humidity of 75% and temperature averaging 32°C.

### Experimental Animals and Design

The research was carried out for a period of twenty two weeks. A total of 40 finisher pigs of large white breed were used for the study. The pigs were divided into 5 groups with 8pigs each. Each group of finisher pigs were respectively allocated to five treatment diets in a completely randomized design (CRD). Each treatment group was replicated twice with 4 pigs (2male and 2female) per replicate.

### Management of Experimental Animals

These pigs were fed twice daily and water supplied *adlibitum*. The treatment diets were formulated with cassava peels/Pkc included at 0, 25, 50, 75 and 100% levels of replacement of maize in the diets. The 1:1 ratio of cassava peels and palm kernel cake was derived by weighing equal quantities (kg) of the two test ingredients using a manual scale. All the diets

were formulated to be iso-nitrogenous and iso-caloric (Table 1).

### Carcass Measurements

At the end of the 22 weeks study, ten pigs consisting of two pigs (male and female) from each treatment were randomly selected for slaughter and measurement of carcass characteristics which includes cut-up parts and relative organs weight. The pigs were weighed and fasted for 16 hours. The fasted weight of each pig meant for slaughtering was taken before they were stunned by percussion method. They were bled by incising with a sharp knife cutting through the jugular vein between the skull and atlas. Complete bleeding and dehairing were done. The stomach of the pigs was opened along the greater curvature and emptied. After the removal of the visceral organs, the remaining carcass was weight as the carcass weight which was expressed as the dressing percentage of the live weight. The head was removed by dissection at the occipital-atlas joint and the feet by sawing through the hock joint at a right angle to the long axis of the leg. The carcass was divided longitudinally. The left half of the carcass was dissected as described by FAO (2004). Ham was separated by locating the division between the 2<sup>nd</sup> and 3<sup>rd</sup> sacral vertebrae and sawed perpendicularly along axis of the ham. Shoulder of the pig was separated from the loin and belly by a straight cut between the second and third ribs and a straight cut between 2.5 centimeter ventral edges of the scapula. The parts were weighed and recorded. Back fat depth was taken at the last rib and the relative organs weight was recorded.

### Statistical analysis

All data collected were analyzed using SAS (2003) package and differences in treatment means were separated using Duncan's Multiple Range Test (Duncan 1955) as outlined by Obi (2002).

**Table 1: Composition of experimental diets for finisher pigs (g/100kg)**

Ingredients	0	25%	50%	75%	100%
Maize	40.00	30.00	20.00	10.00	-
Cassava peels/PKC	-	10.00	20.00	30.00	40.00
Ground Nut Cake	18.87	20.00	21.13	22.28	23.42
Wheat Offal	35.83	33.70	32.37	31.02	29.68
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
Finisher 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
<b>Total</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>
<b>Calculated Analysis:</b>					
<b>Crude Protein (%)</b>	<b>17.81</b>	<b>17.75</b>	<b>17.85</b>	<b>17.90</b>	<b>17.96</b>
<b>ME(Kcal/Kg)</b>	<b>2832.66</b>	<b>2817.94</b>	<b>2801.38</b>	<b>2833.32</b>	<b>2866.25</b>
Fat (%)	4.58	6.20	7.8	9.44	11.09
Fibre (%)	5.03	6.66	8.28	9.98	11.51
Ash (%)	5.91	9.01	12.11	15.30	18.53
Calcium (%)	0.80	0.80	0.80	0.80	0.80
Starch (%)	41.00	37.79	34.58	31.34	28.08

\*Vitamin-mineral premix/kg diet: Vitamin A-8,000 IU, Vitamins D3-3,000 IU, Vitamins E-8 IU, Vitamin K-2mg, Vitamin B1-1 mg, Vitamin B2-0.2 mg, Vitamin B12-5 mg, Nicotinamide-10 mg, Selenium-0.1 mg, Ca Pantothenate-5 mg, Folic acid-0.5 mg, Choline Chloride-150 mg, Iron-20 mg, Manganese-80 mg, Copper-8mg, Zinc-50 mg, Cobalt-0.225mg, Iodine-2 mg Antioxidant-0.1ppm Key:- CPM = Cassava peels meal, 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/m<sup>3</sup>.

## Results

Carcass measurements of the pigs were significantly ( $P < 0.05$ ) affected by the experimental diets (Table 2). The pigs fasted weight (kg) was significantly ( $P < 0.05$ ) affected. Higher ( $P < 0.05$ ) fasted weight was obtained in pigs fed control diet (0% cp/pkc) with the value of 50.00kg, which is similar to those fed the 25% cp/pkc (48kg) diet. Pigs on 50% cp/pkc (42kg) had significantly ( $P < 0.05$ ) lower weight than the pigs fed 75% (38kg) and 100% (32kg) diets. Bled weight also significantly ( $P < 0.05$ ) differ among the groups with recorded values of 0% (46), 25% (42), 50% (37), 75% (31) and 100% (28kg). Carcass weight values ranged from 35.20 (0%) to 19.40kg (100%). Dressing percentage for pigs fed 25% (78.57) diet was highest, followed by 0% (76.52), 50% (71.62), 75% (71.30), and

100% (69.29) diets. Fat free index values were 48.29, 49.22, 51.00, 50.24 and 50.76 for diet 0, 25, 50, 75, and 100% respectively. Back fat (cm) was significantly ( $P < 0.05$ ) highest, in diet 0 (4.60), followed by 25 (3.40 cm), 50 (2.80 cm), 75 (2.40 cm) and 100% (1.78cm) in that order. Pigs cut-up parts was significantly ( $P < 0.05$ ) affected by the experimental diets. Head weight of the pigs fed diets 0% (5.20) and 25% (5.00kg) were higher than those on diets 50 (4.50), 75 (4.08) and 100% (3.32kg) respectively. The Ham weight were 12.00, 12.02, 9.23, 7.60 and 6.80 (kg) respectively while Shoulder weight values were 11.00, 10.00, 8.40, 7.00 and 6.40 kg for diets 0, 25, 50, 75 and 100% respectively. Tail weight values significantly ( $P < 0.05$ ) differ from each other as follows 50 (0.31), 0 (0.30), 25 (0.23), 75 (0.22) and 100% (0.21). Relative organs

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weight as presented in Table 3 shows significant ( $P < 0.05$ ) differences. They include empty stomach, lung, liver, spleen, heart and kidney weight. Empty stomach values were 1 (3.40), 2 (3.50), 3 (2.80), 4 (2.60) and 5 (2.40kg) while that of Lungs were 1.00, 1.02, 0.90, 0.80 and 0.70 kg for diets 1, 2, 3, 4 and 5 respectively. Liver weight of pigs fed the different diets showed the highest in control diet (1.90kg), followed by 25 (1.60), 50 (1.40), 75 (1.30) and 100% (1.20kg). Highest weight

of the spleen was recorded in the control diet 0 (0.40) and the values of 0.33, 0.20, 0.10 and 0.05kg were recorded for diets 25, 50, 75 and 100% respectively. Values recorded for the heart weight were significantly ( $P < 0.05$ ) affected also with values of 25 (0.60), 0 (0.50), 50 (0.40), 75 (0.30) and 100% (0.25kg) respectively. Highest weight of kidney was recorded for control 0 % and 25 % while the least values were recorded in diets 50, 75 and 100% (0.10kg).

**Table 2: Carcass Yields and Cut-Up Parts of Finisher Pigs Fed Diets Containing Different Levels of Cassava Peels/Pkc Mixtures**

Parameters	levels of Inclusion (%) of Cassava peels/pkc in the Diets					SEM
	0	25	50	75	100	
	1	2	3	4	5	
Fasted weight (kg)	50.00 <sup>a</sup>	48.00 <sup>a</sup>	42.00 <sup>b</sup>	38.00 <sup>c</sup>	32.00 <sup>d</sup>	1.29
Bled weight (kg)	46.00 <sup>a</sup>	42.00 <sup>b</sup>	37.00 <sup>c</sup>	31.00 <sup>d</sup>	28.00 <sup>e</sup>	0.91
Carcass weight(kg)	35.20 <sup>a</sup>	33.75 <sup>a</sup>	26.50 <sup>b</sup>	22.15 <sup>c</sup>	19.40 <sup>d</sup>	0.92
Dressed percentage (%)	76.52 <sup>b</sup>	78.57 <sup>a</sup>	71.62 <sup>c</sup>	71.30 <sup>c</sup>	69.29 <sup>d</sup>	0.59
Fat free index	48.29 <sup>c</sup>	49.22 <sup>bc</sup>	51.00 <sup>a</sup>	50.24 <sup>ab</sup>	50.76 <sup>a</sup>	0.81
Back fat (cm)	4.60 <sup>a</sup>	3.40 <sup>b</sup>	2.80 <sup>c</sup>	2.40 <sup>c</sup>	1.78 <sup>e</sup>	0.17
CUT-UP PARTS						
Head weight (kg)	5.20 <sup>a</sup>	5.00 <sup>b</sup>	4.50 <sup>c</sup>	4.08 <sup>d</sup>	3.32 <sup>e</sup>	0.02
Ham weight (kg)	12.00 <sup>a</sup>	12.02 <sup>a</sup>	9.23 <sup>b</sup>	7.60 <sup>c</sup>	6.80 <sup>c</sup>	0.46
Shoulder weight (kg)	11.00 <sup>a</sup>	10.00 <sup>a</sup>	8.40 <sup>b</sup>	7.00 <sup>c</sup>	6.40 <sup>c</sup>	0.53
Loins weight (kg)	10.00 <sup>a</sup>	7.80 <sup>b</sup>	6.20 <sup>c</sup>	5.00 <sup>d</sup>	4.00 <sup>d</sup>	0.51
Tail weight(kg)	0.30 <sup>a</sup>	0.23 <sup>b</sup>	0.31 <sup>a</sup>	0.22 <sup>bc</sup>	0.21 <sup>c</sup>	0.14

a,b,c,d,e means within the same row with different superscripts are significantly ( $P < 0.05$ ) different, SEM: Standard error of mean.

**Table 3: Relative Organ Weight of Finisher Pigs Fed Diets Containing Different Levels of Cassava Peels/Pkc Mixtures**

Parameters	levels of Inclusion (%) of Cassava peels/pkc in the Diets					SEM
	0	25	50	75	100	
	1	2	3	4	5	
Empty stomach (kg)	3.40 <sup>a</sup>	3.50 <sup>a</sup>	2.80 <sup>b</sup>	2.60 <sup>bc</sup>	2.40 <sup>c</sup>	0.13
Lung weight (kg)	1.00 <sup>a</sup>	1.02 <sup>a</sup>	0.90 <sup>ab</sup>	0.80 <sup>bc</sup>	0.70 <sup>c</sup>	0.10
Liver weight (kg)	1.90 <sup>a</sup>	1.60 <sup>b</sup>	1.40 <sup>bc</sup>	1.30 <sup>c</sup>	1.20 <sup>c</sup>	0.12
Spleen weight (kg)	0.40 <sup>a</sup>	0.33 <sup>ab</sup>	0.20 <sup>b</sup>	0.10 <sup>b</sup>	0.05 <sup>c</sup>	0.06
Heart weight (kg)	0.50 <sup>a</sup>	0.60 <sup>a</sup>	0.40 <sup>ab</sup>	0.30 <sup>b</sup>	0.25 <sup>b</sup>	0.09
Kidney weight (kg)	0.20 <sup>a</sup>	0.20 <sup>a</sup>	0.10 <sup>b</sup>	0.10 <sup>b</sup>	0.10 <sup>b</sup>	0.04

a,b,c,d,e means within the same row with different superscripts are significantly ( $P < 0.05$ ) different, SEM: Standard error of mean.



## Discussion

Results on the carcass parameters/measurements of pigs indicated that fasted weight, bled weight, dressing percentage, fat free index and back fat thickness were significantly ( $P<0.05$ ) affected by dietary treatments. Similarly cut-up parts which include head weight, Ham weight, shoulder weight, loin weight and tail weight were significantly ( $P<0.05$ ) affected by the diets. Results showed depressed weights of all parts evaluated as the cassava peels/pkc levels of the diet increased. This is contrary to the work of Iyayi and Davies (2005) and Adesehinwa *et al.* (2011) who reported that cassava peels meal as a replacement of maize do not have a deleterious effect on the carcass characteristics of pigs. However, the results were in line with Oboh *et al.* (2004), who recorded significant negative effect ( $P<0.05$ ) when they use graded levels of rubber seed cake (RSC) as replacement for maize on hot dressed weight.

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- Significant ( $P<0.05$ ) differences were recorded for relative weights of the empty stomach, liver, spleen, heart and kidney. The values were higher for organs weight for the control group. The result is in agreement with Oboh *et al.* (2004) who recorded significant ( $P<0.05$ ) effect in feeding of graded levels of rubber seed meal as a replacement for groundnut cake compared to other treatments. The result is however, contrary to Amaefule *et al.* (2012) who reported depressed carcass characteristics of pigs when increased levels of Pkm was used in the diets of pigs from 20.55 to 61.51 %. The depression in this study may be attributed to the higher crude fibre level of cassava peels and palm kernel cake compared to maize.

## Conclusion

Carcass characteristics parameters were depressed with increased levels of cassava peels/pkc meal. However at 25% level of inclusion of cassava peels/pkc, carcass characteristics compared favourably with control and therefore 25% inclusion level is recommended.

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