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Assessment of Cassava Peel/Palm Kernel Cake Meal (PKM) on Growth Performance and Blood Parameters of Lactating Sows (Agricultural Extension Implication)

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ABSTRACT

A four weeks study was carried out to assess the effect of cassava peel/palm kernel cake meal on the growth characteristics of lactating sows, piglets and blood parameters. Forty large white lactating sows with average weight (72-78kg) and piglets mean weight range from 27 to 35kg were randomly distributed to the five treatments in a completely randomized design (CRD). The combination was attained on one to one weight basis. The combinations replaced maize at 0 (control), 10, 20, 30 and 40%. Feed/water were made readily available. The results on performance characteristics, hematological parameters and serum biochemical parameters fed difference inclusion of cassava peel/PKC meal were significantly ($P<0.05$) influenced. Performance of lactating sows recorded a higher weight loss 30% (18.13kg) and piglet mortality 40% (14.81%), while piglet average weekly weight gained (7.5kg) and weaned (30) was better in 10%. However, this study recommended 10% level of cassava peel/pkc meal in lactating sow feed.

Key words: Growth Performance, Lactating Sow, Piglets, Cassava Peel/Palm Kernel Cake, Blood Parameters

INTRODUCTION

Nigeria is among the highest populated black race in the world and ranked first in Africa. However, the country is not growing along with its population in areas of world technological advancement that will translate into food production that will meet up needs of its populace used to calculate the growth domestic product. Nigeria has continuously dropped in the world ranking today due to inadequate channeling or total neglect of agriculture most especially livestock (Moseri et al., 2020). In Nigeria, Agriculture accounts for 35% of GDP before the predominance of oil, and major earner of foreign currency. Now the oil is on a decline, there is a great clamor for diversification of Nigerian economy. This has to redirect attention to Agriculture and now is the time for government of Nigeria to pay unprecedented attention to agricultural development that will serve as an instrument in reducing hunger, malnutrition and starvation (Amaza et al., 2021). Livestock have been an important subsector of agriculture in Nigeria contributing about 1.24 trillion and fishing 384.4 billion naira respectively. Furthermore, engaging about 35% of the country's population; the sector has equally been a major provider of animal protein, thereby making a significant contribution to national nutritional security. There is dearth between the population and food production in our country today due to kidnapping, banditries and insecurity that is forcing most of the farmer out of production (Moseri et al., 2020). However, efforts should be channel in the utilization of locally available agro waste materials such as brewery dried grains, palm kernel waste, etc. in other to reduce a stiff competition currently between human and animals for conventional grains, to salvage these problems being encountered by farmers most especially piggery farmers. Hence cassava peel and palm kernel cake meal will serve as pivotal that will help to ameliorate this problem today. Thus, the objective of this study was to assess the effect of cassava peel and pkc meal on the performance characteristic and blood parameters of lactating sows.

MATERIALS AND METHODS

Experimental Site

The study was done at research farm, Faculty of Agriculture, Ambrose Alli University, Ekpoma, Edo state Nigeria.

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Source of Test Ingredients

The cassava peel and palm kernel cake were sourced from garri factories and open markets within Agbor town. Other constituents were procured from renowned animal feed dealers in Benin City and its neighborhoods.

Investigational Animals Design, Housing and Management

The research farm is an improved Danish type of housing, with fundamental passage and exposed bodybuilding yards, the main structural sorts of the house is low walls of 1.2m, over which are timber frames and supporting roof. The roof was made up of asbestos, ideal for heat shield and protection from the effect of direct solar emission and control of thermal tension. Pigs were housed on a concreted floor pen, each of which had a concrete inherent water trough and feeding cubicles. A total of 40 gilts average weight (72-78kg) of large white and mean initial weight of piglets (27-34kg) were distributed into 5 groups created on regular initial weight in a Completely Randomized Design (CRD). The lactating sows were fed double daily and water supplied *ad libitum*. The treatment diets contained a mixture of sundried cassava peels and PKC (in a 1:1 ratio, w/w) at 0, 10, 20, 30 and 40% respectively. The 1:1 ratio of cassava peel to palm kernel cake was derivative by mixing equivalent weights (kg) of the two test constituents in the diet using a manual scale. All diets were formulated to be iso-nitrogenous and iso-caloric in Table 1. The experiment lasted for four weeks of post natal sow.

Data Collection

Feed intake and weight gain were recorded, a known quantity of feed was supplied and the corresponding left over recovered and measured. The difference between what was supplied and the left over divided by the time intermission is the daily feed intake. Pigs from each level were weighed at the commencement and subsequently weekly to determine the body weight. The dissimilarity between the initial and final body weight is the weight gain viz; average piglet birth weight (kg), average piglets weaned weight (kg), number of piglet's weaned weight (kg), weight loss during lactation (kg) and mortality rate. Animals were deprived of feed for 12 hours before blood samples were taken from each pig from the ear vein via a sterilized disposable syringe and needle. Preceding to bleeding, a cotton swab soaked in 70 % ethanol was used to clean the ear vein and to inhibit infection or impurity of the blood sample. A 5.0ml blood was taken from each pig into branded sterilized bottles comprising Ethylene-Diamine-Tetra-Acetic acid (EDTA) as anticoagulant, were used to determine the total red blood cells (RBC), hemoglobin (Hb), and packed cell volume (PCV) and white blood cell (WBC). Another 5.0 ml of blood was collected into labeled sterile sample bottles without anticoagulant were used to determine the serum biochemical components of total protein, albumin, globulin and serum cholesterol.

Data Analysis

Data were analyzed with SAS (2003) package, and differences amongst treatment means were parted using Duncan's multiple range test (1955) as defined by Obi (2002).

RESULTS

Performance characteristics of lactating sows is shown in Table 2. Average final weight loss value of lactating sow was lowest in control diet (63.78kg) and increased as an increasing rate of the diets of 10 (60.50), 20 (58.29), 30 (55.55) and 40% (53.13kg) respectively. Significant ($P<0.05$) differences was noted in average total weight

Table 1: Composition of experimental diet for lactating sows fed cassava peel/pkc meal

Ingredients	0	10%	20%	30%	40%
Maize	40.00	36.00	32.00	28.00	24.00
Cassava peel/PKC	-	04.00	08.00	12.00	16.00
Ground Nut Cake	15.87	17.00	18.13	19.26	20.39
Wheat Offal	38.18	36.05	34.72	33.39	32.06
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
Fattener 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
Lysine	0.65	0.65	0.65	0.65	0.65
Total	100.00	100.00	100.00	100.00	100.00
Calculated Analysis:					
Crude Protein (%)	16.92	16.54	16.36	16.69	16.87
ME(Kcal/Kg)	2770.86	2774.00	2734.92	2758.48	2737,44
Fat (%)	4.58	6.20	7.8	9.44	11.09
Fiber (%)	5.03	6.66	8.28	9.98	11.51
Ash (%)	5.91	9.01	12.11	15.3	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: sodium sulfate (52.7%), calcium carbonate (15%), kaolin (9%), dextrin and sucrose (8%), cellulose (6%) and vegetable oil (7%).

loss of lactating sows, highest weight loss value was recorded for 40% (18.13kg) and the least weight loss value was in 0% (14.22kg). Lactating sows average weekly feed intake ranged from 34.90kg (40%) to 43.74kg (20%) in the experimental diets.

Performance characteristics of piglets at 28 days after farrowing is shown in Table 3. Total weight of the piglet values ranges from 27.68kg (40%) to 31.04 kg (0%) fed cassava peel/pkc meal. Significant (P<0.05) differences were documented in total weight gain, number of piglets weaned, average weekly weight gain and mortality percentage at weaned. Final total weight gain of piglets value was highest in 10% (225.00kg) and lowest in 40% (100.25kg), while the average weekly weight gain was better in 10% (7.50kg) compared to 0% (7.25kg), 20% (6.75), 30% (5.75kg) and 40% (5.05kg) with least gain.. Number of piglets had the highest value in 10% (30.00kg) and least value was in 40% (22.02kg). However, mortality percentage recorded was highest in 30% (14.81) and lowest in 40% (3.25).

Hematological parameters of lactating sows shown in Table 4. Result shows a significant (P<0.05) difference in packed cell volume (PCV) values of 37.70, 37.50, 49.50, 43.48 and 41.82 % were recorded for 0, 10, 20, 30 and 40 % diets respectively. Red blood cell (RBC) had the highest value of $15.65x10^{-6}$/ml (0 %) diet with the lowest value of $6.05x10^{-6}$/ml (40 %) sows. White blood cell (WBC) recorded values of 13.10, 20.20, 9.60, 15.60 and $19.40x10^{-3}$/ml for sows fed 0, 10, 20, 30 and 40 % diets respectively. Hemoglobin was highest in 20 % (14.50g/dl), and lowest value in 40% (10.80g/dl). Mean corpuscular volume (MCV) value ranged from 65.60 to 69.20(g/dl). Mean corpuscular hemoglobin (MCH) had the highest in 40% (20.80pg) and least value was observed in 30% (19.70pg). Mean corpuscular hemoglobin concentration (MCHC) values ranges from 29.90 (0%) to 30.10 % (20%).

Serum biochemical parameters of lactating sows is presented in table 5, total protein, albumin, globulin, creatinine, urea, cholesterol and glucose significantly (P<0.05) differed in the diets. Total protein value was highest in 0 % (13.49g/dl), followed by 30 (9.30), 10 (8.75), 40 (8.64) and 20% (8.60) g/dl) with lowest value. Albumin values of sows fed diet 0, 10, 20, 30 and 40 % were 5.08, 3.57, 4.35, 4.58 and 4.49 g/dl separately. Globulin values decreased as the stages of cassava peels/pkc diet increased with obtained values of 8.41, 5.18, 4.25, 4.72, and 4.15 (g/dl) for 1, 2, 3, 4 and 5 diets. Creatinine values ranges from 1.97 to 2.93 (g/dl). Urea diets of 0, 10, 20, 30 and 40 % with values of 61.12, 36.23, 45.98, 44.39 and 31.25 (g/dl) respectively. Cholesterol values ranged from 40% (64.80mg/dl) to 0% (130.39mg/dl). Glucose values were 0 (68.96), 10 (74.69), 20 (69.15), 30 (69.96) and 5 (60.75mg/dl) in that order.

Table 2: Performance of lactating sows fed cassava peel/pkc meal

	Levels of Inclusion (%)					
	0	10	20	30	40	
Parameters	1	2	3	4	5	SEM (±)
Average initial weight of lactating sow (kg)	78.00^{a}	77.50^{a}	73.00^{bc}	74.00^{b}	72.00^{c}	0.98
Average final weight loss of sow (kg)	63.78^{a}	60.50^{b}	58.25^{c}	55.55^{d}	53.13^{e}	0.25
Average weight loss of sow (kg)	14.22^{d}	17.00^{bc}	14.75^{d}	18.00^{ab}	18.13^{a}	0.35
Average total feed intake (kg)	275.25^{a}	262.50^{b}	225.74^{c}	225.74^{c}	210.00^{d}	0.15
Average weekly feed intake (kg)	42.88^{b}	43.74^{a}	41.13^{c}	37.63^{d}	34.90^{e}	0.22

a,b,c,d,e means along the same row with different superscripts are significant different from each other, SEM: Standard error of mean.

Table 3: Performance of piglets at 28 weeks after farrowing fed cassava peel/pkc meal

	Levels of Inclusion (%)					
	0	10	20	30	40	
Parameters	1	2	3	4	5	SEM (±)
Average initial weight of piglet (kg)	31.04^{b}	34.01^{a}	31.90^{b}	29.70^{c}	27.60^{d}	0.08
Final total weight gain (kg)	210.25^{b}	225.00^{a}	182.25^{c}	132.25^{d}	100.25^{e}	0.15
Number of piglets weaned (kg)	28.00^{bc}	30.00^{a}	27.00^{c}	23.00^{d}	22.00^{e}	0.42
Average weekly weight gain (kg)	7.25^{b}	7.50^{a}	6.75^{c}	5.75^{d}	5.05^{e}	0.09
Mortality (%)	9.38	3.25	6.90	14.81	4.35	-

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

Table 4: Hematological parameters of the lactating sows fed cassava peel/pkc meal

	Levels of Inclusion (%)					
	0	10	20	30	40	
Parameters	1	2	3	4	5	SEM (±)
PCV (%)	37.70^{d}	37.50^{d}	49.50^{a}	43.48^{b}	41.82^{e}	0.02
RBC (x 10^{-6}/ml)	15.65^{a}	5.56^{e}	7.18^{b}	6.67^{c}	6.05^{d}	0.02
WBC (x 10^{-3}/ml)	13.10^{d}	20.20^{a}	9.60^{e}	15.60^{c}	19.40^{b}	0.04
Hb (g/dl)	11.70^{c}	14.25^{ab}	14.50^{a}	13.90^{b}	10.80^{d}	0.24
MCV (g/dl)	66.80^{c}	67.60^{b}	69.00^{a}	65.60^{d}	69.20^{a}	0.21
MCH (pg.)	20.00^{b}	20.10^{be}	20.70^{a}	19.70^{b}	20.80^{a}	0.21
MCHC (%)	29.90^{c}	29.80^{d}	30.10^{b}	30.20^{a}	30.10^{b}	0.03

a, b,c,d,e means along the same row with different superscripts are significantly (P< 0.05) different from each other**,** SEM: Standard error of mean.

Table 5: Serum biochemical parameters of lactating sows fed cassava peel/pkc meal

	Levels of Inclusion (%)					
	0	10	20	30	40	
Parameters	1	2	3	4	5	SEM (±)
Total protein (g/dl)	13.49[a]	8.75[c]	8.60[d]	9.30[b]	8.64[d]	0.02
Albumin (g/dl)	5.08[a]	3.57[e]	4.35[d]	4.58[b]	4.49[c]	0.02
Globulin (g/dl)	8.41[a]	5.18[b]	4.25[d]	4.72[c]	4.15[e]	0.02
Creatinine (mg/dl)	2.93[a]	2.87[b]	1.97[d]	2.75[c]	1.97[d]	0.02
Urea (mg/dl)	61.12[a]	36.23[d]	45.98[b]	44.39[c]	31.25[e]	0.02
Cholesterol (mg/dl)	130.39[a]	106.97[b]	64.80[b]	94.47[c]	64.80[d]	0.02
Glucose (mg/dl)	68.96[d]	74.69[a]	69.15[c]	69.92[b]	60.75[e]	0.02

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

DISCUSSION

Results on performance characteristics of lactating sows fed varied inclusions of cassava peel/pkc meal based diets shown in Table 2, indicated that dietary treatments compete favorably in average weight loss of lactating sows falls within the recommended 20% body loss of sows during lactating period. The average final weight loss was highest in 40 % diet, this indicated that lactating sows fed 40% diet suffered more weight loss compared to other diets, while 20 % cassava peels/pkc performed better in the weight loss or weight decrease fed the diets translated more to the piglet weight. The results agreed with the conclusion of Borges et al. (2005) who recommended a weight loss of lactating sows between 11 – 22kg within a lactating period of 28 days. Average total feed intake and average weekly feed intake in the dietary treatments reduced with amplified stages of cassava peel/pkc meal in the diets. However, variation in feed intake noticed could be ascribed to sows that have a higher number of piglets which will consumed more feeds to meet up the required milk by the piglets which is in concomitant with Nielson et al. (2013), that posited small litters size consumed lesser feed compared to a higher litter sizes. The body weight of piglet, final total weight gain, number of piglet weaned and average weekly weight gain presented in Table 3, indicated that 10% diet have contributed higher individual growth rates compared to other diets because there is more milk available for each of the pigs in the litter and increase the survival rate of the piglets. This finding corroborates with Grez et al. (2016) in their study that reported a range of 6.20 – 7.00 kg piglet weight at 28 days. The birth weight depend on placental nutrient supply which is largely determined by placental size. Piglets weight at farrowed and weaned fall within recommended size by Jackson (2009) who posited a range of 0.8-1.6 kg for normal piglets weight at farrowed that support early weaning, high levels of survival and reduced loss of sow body mass. Mortality was highest at 30 % which can be attributed to the weaned weight that was below recommended weight by Grez et al. (2016). The significance of blood cannot be exaggerated as we all know that blood plays a vivacious role in the life of all living organisms. Blood can be used to measure the abnormality in cells which impair the primary physiological functions of the animal body. Hematological aberration is vital in determining how healthy an animal is as an evidence of the extent of toxicity and nutritional quality of the levels of inclusion of some important feed ingredients. The hematological values of lactating sows shown in Table 4, packed cell volume (PCV), white blood cell (WBC) and Red blood cell (RBC) falls within recommended range of pigs. This indicated absence of infection and toxicity in lactating sows fed the experimental diets, compete favorable with the control and values were within the standard ranges reported by Moseri et al. (2020). When hematological values fall within the normal assortment recognized for the animal, is a sign that diet did not show any antagonistic effect during the study. Further agreed with Etim et al. (2014) posited that hematological behaviors especially PCV and Hb were associated with the nutritional status of animals. It was concluded that the diets were not destructive to the lactating sows. Serum biochemical parameters shown in Table 5, indicated that protein levels in the diet sustained standard protein reserves in lactating sows occasioning from effective protein consumption. It has proved that protein reserves of animals are influenced by dietary protein without any shortage or alterations of albumin content (Adesehinwa et al., 2011). Serum creatinine and urea levels shows that lactating sows ensured muscular efficient of diets. This result validated the report of Moseri et al. (2020).

Conclusion

The study has showed that feeding of 10% cassava peel/pkc meal to a lactating sow compete famously with other diets in area of weight loss, piglets weaned and weight gain. It is therefore recommended to incorporate 10% of cassava peel/pkc meal into lactating sow feed.

Agricultural Extension Implication

Agricultural extension service providers should target pig farmers in the study area with the view of educating them on the use of cassava peel/Pkc meal in the feeding of lactating sow. Emphases should be on 10% inclusion of cassava peel /PKC meal as it have proved to be a better replacement for maize in the feeding of lactation sow. This will help farmers to reduce the production cost expended from the use of conventional feed.

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