GROWTH PERFORMANCE AND COST BENEFITS OF FEEDING GROWING PIGS WITH CASSAVA PEEL MEAL-BASED DIETS SUPPLEMENTED WITH A COMMERCIAL ENZYME

O.M. ADEYEMI, O.T. IREKHORE, O.M. O. IDOWU, O.S. AKINOLA AND K.O. BELLO
College of Animal Science and Livestock Production, Federal University of Agriculture, Abeokuta, Nigeria.
oluwakemiirekhore@gmail.com

ABSTRACT
An experiment was conducted to investigate the effects of replacing maize with cassava peel meal (CPM) supplemented with a commercial enzyme, on the growth performance and cost benefits of growing pigs. Twenty-four growing pigs with average weight of 14.0 ± 0.25 kg were allotted to 6 dietary treatments, where CPM replaced maize at 0, 50 and 100% levels with enzyme supplementation at 0g/100kg and 20g/100kg of diet. Each treatment was replicated 4 times while the experiment lasted 8 weeks. Data were collected on daily feed intake (DFI), daily weight gain (DWG), feed conversion ratio (FCR), feed cost/weight gain and feed cost/day. The CPM based diets gave comparable (P>0.05) pigs' growth performance especially in terms of DWG (0.32 – 0.40) and FCR (3.13 – 4.03) as did the maize based diets. Feed cost/day (₦70.35 – ₦98.01) as well as feed cost/weight gain (₦195.33 – ₦244.65) reduced insignificantly (P>0.05) with inclusion of CPM in the diets of the pigs. Enzyme supplementation of diets did not influence (P>0.05) pigs' growth performance and cost benefit. Cassava peel meal can totally replace maize without enzyme supplementation in the diets of growing pigs to reduce cost with optimal performance.

INTRODUCTION
Growing pigs need an appreciable amount of energy to grow well. Energy in pig's diet is usually supplied by carbohydrate sources such as maize and other cereals. The expensive nature of these cereals in terms of cost and inadequacy coupled with their erratic supply has potentially limit their availability for use in pig's diet formulation. Cognizant of the high demand for grains for human consumption and industrial uses, Fetuga and Tewe (1985) observed the possibility of not having enough supplies of cereals to match their demand for livestock production. Furthermore, the recent trend of increased industrial demand for maize and other cereals, particularly for biofuel production as well as the increased demand for the ever increasing human population has resulted in extremely high cost of the cereals (Irekhore *et al.*, 2006). Between 2005 and now the price has increased over five folds. Moreover, cereal production in developing countries like Nigeria cannot keep the pace with the demand for human consumption and livestock feeding (Adesehinwa *et al.*, 1998), hence the need for alternative feedstuffs. One of such alternative is cassava peel meal (CPM). Cassava peel which is the ultimate waste product of cassava processing has been reported to serve well as an alternative energy source depending on the level of its inclusion. The reports on the incorporation of CPM in the diets of monogastrics revealed that this potentially valuable feedstuff is still grossly underutilized in Nigeria as large quantities are left to rot away after peeling (Akinfala and Tewe, 2004). Its use as energy source particularly in the diet of monogastrics has been limited largely due to its high fibre (Adesehinwa, 2008) and partly due to its low protein content and the presence of anti-nutrient (hydrogen cyanide). This research sought to improve utilization of cassava peel as energy source by growing pigs using an exogenous commercial enzyme, Allzyme® SSF. Allzyme® SSF is a multi-enzyme complex produced by a carefully selected strain of non genetically modified *Aspergillus niger*, which expresses seven enzyme activities. It is capable of increasing the release of phytate-bound phosphorus, energy and protein from pig and poultry feeds (Alltech, 2009).

MATERIALS AND METHODS
The research was carried out in the Piggery Unit of the Directorate of University Farms (DUFARMS) of the Federal University of Agriculture, Abeokuta, Nigeria. The area lies on latitude 7013'N and longitude 3025'E, 76m above sea level and located in the tropical rainforest vegetation zone with an average temperature of 34.7^{0}C. Fresh cassava peels were collected from cassava processing units in Odeda Local Government Area of Ogun State, Nigeria, sundried and milled to form the cassava peel meal (CPM). Allzyme®

SSF was purchased from Alltech Distributor in Lagos, Nigeria. The CPM was then used to formulate 6 experimental diets such that CPM replaced 0, 50 and 100% of maize components while Allzyme® SSF (SSF) was added at two levels (0g/100kg and 20g/100kg) for each of the three CPM inclusion levels. This resulted in six (6) dietary treatments (Table 1); using a 3 x 2 factorial arrangement, in a completely randomized design (CRD). Representative samples of each diet were taken and analyzed using the method of Association of Official Analytical Chemists (AOAC, 2012). Gross energy values were determined using bomb calorimeter while ADF and NDF were determined using fibretec hot and cold extraction unit apparatus following standard procedures of Van Soest (1994). Hydrocyanide content was determined using the method of Essers *et al.* (1993). Twenty four large white growing pigs about 10 weeks old with average initial live weight of 14.0 ± 0.75 kg were used for the experiment. They were held in quarantine and treated with ivomectin injection at the rate of 1ml/50kg body weight before placing them on the experiment. They were randomly assigned to any of the 6 dietary treatments with 4 pigs per treatment, each pig being a replicate. The pigs were housed and fed individually in concrete pens equipped with shallow concrete feeders and drinkers. Feed was supplied *ad libitum* and clean water was made available all through the experimental period of 8 weeks. Data were collected on initial weight, final weight, daily feed intake, daily weight gain, feed conversion ratio, cost per kilogramme of feed, feed cost per kilogramme weight gain and feed cost per day. All data obtained were subjected to one way analysis of variance (CRD) in a 3 x 2 factorial arrangement. Minitab Analytical Computer Package (Minitab Inc. 2000) was used for all statistical analyses.

RESULTS AND DISCUSSION

The growth performance and cost benefits of the pigs are presented in Table 1. All parameters considered were not significantly (P>0.05) influenced by replacement of maize with CPM and enzyme supplementation of pigs' diets. Pigs' feed intake (1.29-1.33kg) did not follow any particular trend and was not influenced (P>0.05) by the dietary treatments. Results showed that the CPM based diets gave similar (P>0.05) pigs' growth performance in terms of daily weight gain and final body weight as the maize based diets. Damisa and Bawa (2007) however, reported a trend of depressed weight gain as the level of CPM increased in pigs' diet. Supplementation of diets with Allzyme® SSF did not (P>0.05) improve growth performance as against the reports of Akintunde *et al.* (2011), Alltech (2009) and Kanto *et al.* (2009) who reported consequent increase in the average daily weight gain upon Allzyme® SSF supplementation of growing pigs' diets. Values (3.13 – 4.03) observed for the feed conversion ratio (FCR) were similar (P>0.05) for all the pigs across the dietary treatments. The FCR as reported by Edwards *et al.* (1989) is an important determinant of profitability. Kanto *et al.* (2009) reported poor FCR values for pigs fed cassava-based diets despite Allzyme® SSF supplementation. The cost benefit analysis revealed that feed cost per kilogramme of diet reduced insignificantly (P>0.05) with inclusion of CPM and increased insignificantly (P>0.05) with enzyme supplementation of pigs' diets. The feed cost/day (₦70.35 – ₦98.01) as well as feed cost/weight gain (₦195.33 – ₦244.65) reduced insignificantly (P>0.05) with inclusion of CPM in the diets of the pigs. This could be explained by the exponential effect of low price per kilogramme of cassava peel meal. Irekhore *et al.* (2006) reported a decrease in the cost of feed upon the inclusion of cassava peel meal in the diets of growing pigs. The work of Tewe and Oke (1983) and the review made by Adesehinwa (2008) also affirmed that the inclusion of cassava peel meal in the diet of pigs will drastically reduce feed cost. Akinola *et al.* (2009) also reported that cassava by-products can be effectively utilized to reduce the feed cost for pigs.

CONCLUSION

Pigs feed intake, body weight gain, feed conversion ratio and feed cost per weight gain were not significantly influenced by dietary replacement of maize with cassava peel meal or enzyme supplementation of the diets. It is therefore technically feasible to formulate a practical diet for pigs with up to 100% replacement of maize with cassava peel meal without enzyme supplementation and still obtain a good performance of the animals.

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Table 1: Composition of Cassava Peel Meal Diets Supplemented with Allzyme® SSF Experimental Diets (%) Fed to Growing Pigs

CPM	0%		50%		100%	
Allzyme® SSF	-	+	-	+	-	+
Maize	40.00	40.00	20.00	20.00	0.00	0.00
CPM	0.00	0.00	20.00	20.00	40.00	40.00
SBM	10.00	10.00	10.00	10.00	10.00	10.00
GNC	15.00	15.00	15.00	15.00	15.00	15.00
Wheat offal	18.00	18.00	18.00	18.00	18.00	18.00
PKC	13.60	13.60	13.60	13.60	13.60	13.60
Oyster shell	1.50	1.50	1.50	1.50	1.50	1.50
Bone meal	1.00	1.00	1.00	1.00	1.00	1.00
Vit/Min Premix	0.40	0.40	0.40	0.40	0.40	0.40
Salt	0.50	0.50	0.50	0.50	0.50	0.50
Total	100.00	100.00	100.00	100.00	100.00	100.00

Analysed Composition						
Dry matter(%)	91.10	91.10	90.80	90.80	90.00	90.00
CP(%)	18.49	18.49	17.82	17.82	16.84	16.84
CF (%)	7.67	7.67	8.54	8.54	9.96	9.96
Fat (%)	5.86	5.86	5.49	5.49	4.81	4.81
Ash (%)	7.09	7.09	9.36	9.36	9.24	9.24
NFE (%)	53.64	53.64	49.59	49.59	48.50	48.50
GE (Kcal /kg)	3922.50	3922.50	3877.10	3877.10	3855.00	3855.00
NDF (%)	21.63	21.63	31.10	31.10	24.93	24.33
ADF (%)	9.24	9.24	15.43	15.43	19.37	19.37
HCN (mg/100g)	0.00	0.00	0.01	0.01	0.01	0.01

Table 2: Performance and Cost Benefit of Growing Pigs Fed Cassava Peel Meal Diets Supplemented with Allzyme® SSF

CPM	0%		50%		100%		
SSF	-	+	-	+	-	+	SEM
Parameter							
Initial body weight (kg)	14.75	14.25	14.00	14.5	14.75	14.25	0.58
Final body weight (kg)	37.25	36.88	34.00	35.25	35.5	32.13	1.12
Daily feed intake (kg)	1.33	1.26	1.28	1.33	1.30	1.29	0.03
Daily weight gain (kg)	0.40	0.40	0.35	0.37	0.36	0.32	0.01
Feed conversion ratio	3.32	3.13	3.59	3.59	3.61	4.03	0.15
Feed cost/kg (₦)	73.69	74.39	63.89	64.42	54.11	55.00	1.57
Feed cost/weight gain (₦/kg)	244.65	232.84	229.36	231.26	195.33	221.65	8.95
Cost of feed/day (₦)	98.01	93.73	81.77	85.67	70.35	70.96	2.81