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Growth Performance Characteristics of Pigs Fed Fermented Palm Kernel Cake Based Diets

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Abstract

This study was carried out to determine growth performance of pigs fed fermented PKC. Eighteen 12 weeks old grower pigs selected from the Piggery Unit of the Teaching and Research Farm of the Federal University of Technology, Owerri were randomly assigned to three dietary groups with two replicates comprising three boars and three gilts each. Diet A had unfermented PKC while diets B and C contained PKC in water and in 2% sugar solution fermented for 6 days respectively. All animals were fed together and allowed a feed equal to 4% of their total body weight and water provided *ad libitum* for 8 weeks. Data on average daily weight gain (ADWG), average daily feed intake (ADFI), feed conversion ratio (FCR) and cost of feed per kilogram was collected and analysed using randomised complete block design (RBCD). Results showed that there were no significant differences ($p < 0.05$) found in all parameter measured. This shows that within this study, the fermentation process did not improve the nutritive value of PKC.

Keyword: Palm kernel cake, pig, fermentation, performance

Introduction

Animal products make an important contribution to nutrient supply in human diets which include energy, high quality protein and most of the important minerals and vitamins needed for the normal functioning of the body. These products have high biological values because of high contents of essential amino acids, minerals, vitamins and essential fatty acids. In addition they make up for the bland taste of starchy foods that form the bulk of human diets. In Nigeria, meat is a principal source of animal protein. A significant proportion of meat consumed in Nigeria comes from monogastric animals, namely poultry and pigs. The production of these animals also holds the higher potential for bridging the deficit in meat consumption not only in Nigeria but in most developing countries of the sub-Saharan region (Aladi, 2015).

However, pig production has been known to face numerous challenges in Nigeria (Eko, 2009). Prime among these challenges is the high cost of feed. Pigs depend largely on maize as the major source of energy (McDonald *et al.*, 2010). In Nigeria and most developing countries of the world, maize is an important staple food for humans (Udedibie, 2002). The rise in price of maize is majorly responsible for the high cost of pork meat. In order to sustain production at competitive prices, farmers have often resorted to inclusion of alternative feed ingredients as substitutes for conventional feedstuffs (Okeudo *et al.*, 2005; Obun, 2013; Okah *et al.*, 2013; Okoli *et al.*, 2013).

Palm kernel cake has been reported to be a cost effective ingredient that can be utilized in ration formulation in livestock feeding (Zahan and Alimon, 2006., Adesehinwa, 2007; Okeudo *et al.*, 2005; Egenuka *et al.*, 2013). PKC does not serve as food for man or have any other industrial use at the present. It is easily available and can be obtained at a relatively cheap price. The global production of PKC is increasing as oil palm industries expand in many parts of Nigeria, Africa and Asia in recent years. More than four million metric tons of PKC was produced globally in the year 2002 (FAO, 2002) and most of them were utilized in to animal feeding (FAO, 2002). The use of this by-product in monogastric nutrition is however limited. The high fibre content of 13% and low metabolizable energy value (Ariff Omer *et al.*, 1998) have been identified as major limitations to its utilization in the feeding of non ruminants. It is reported to contain 30% β -mannan which is an anti-nutritional factor capable of causing depression in feed conversion efficiency and reduction in weight gain by 20% - 25% in poultry (Ariff Omer *et al.*, 1998). It is gritty and requires further processing such as grinding or milling, addition of exogenous enzymes containing cellulase and mannanase (Sundu *et al.*, 2003) as well as solid state fermentation (Sukaryana, 2001).

The use of PKC as substitute is limited by its content of non starch polysaccharides (NSP) especially mannan. Solid state fermentation using fungi such as *A. niger*, *A. oryzae*, *T. resei* etc. has improved utilization of PKC. However supply and maintenance of pure cultures of these fungi strains have been difficult especially on farm situations. The development and implementation of spontaneous fermentation techniques is therefore a worthwhile alternative to be evaluated. Thus this study was undertaken to determine the performance of pig fed fermented palm kernel cake.

Materials and Methods

This study was carried out at the Teaching and Research Farm (FUTO). Owerri is located in the south eastern part of Nigeria with an altitude, mean annual rainfall, temperature and humidity of 90 cm, 200-250 mm, 26.5-27.5 °C and 70 – 80 %, respectively. Imo state lies between latitude 4°45'N and 7°15'N and Longitude 6° 50'E and 7°25'E (Ministry of Lands and Survey, 1984). Expeller palm kernel cake used in the experiments was procured from local dealers in Owerri, Imo State. The PKC was run in a hammer mill (0.2 mm sieve size) to homogenize the particle size and was divided into three equal parts labeled A, B, C. Sample A was kept as control while samples B and C were mixed with water (w/w) and 2% sugar solution respectively and fermented for 6 days before use. The proximate compositions of the experimental materials were measured using standard procedures (AOAC 1990). Eighteen 12 weeks old grower pigs (9 males and 9 females) of mixed breed selected from the Piggery Unit of the Teaching and Research Farm, FUTO were randomly assigned to the three dietary groups (Table 1) with 2 replicates comprising of three boars and three gilts each. Each sex within a dietary group was kept in separate pens and dewormed. Animals in each pen were fed together and allowed feed equal to 4 % of their total body weight throughout the experiment while water was provided *ad libitum*. The feeding trial lasted for 8 weeks. Three (3) experimental diets A, B, C were formulated. Diet A had unfermented palm kernel while diets B and C contained palm kernel cake fermented either in water or in 2% sugar solution, respectively.

The live weights of the pigs were measured at the beginning of the experiment. They were also weighed every two weeks. The average daily weight gained by the animals was calculated as the difference between the final weight of the animal and their initial weight divided by the period of the experiment (days). The total quantity of feed consumed per animal in each treatment unit was determined and then divided by the period of the experiment to get average daily feed intake (ADFI). Feed conversion ratio was calculated as ADWG divided by ADFI. Cost of feed per kilogram was calculated using the diet composition and prevailing market prices of the ingredients. Cost per kilogram weight gain was calculated as the feed conversion ratio multiplied by the feed cost. Data was analysed using a randomised completely block design.

Table 1: Ingredients and calculated chemical composition of the experimental diets.

Ingredients	A	B	C
Maize	20.00	20.00	20.00
Palm kernel cake	40.00	-	-
Fermented palm kernel cake in water	-	40.00	-
Fermented palm kernel in sugar solution	-	-	40
Soya bean meal	8.00	8.00	8.00
Wheat offal	25.00	25.00	25.00
Bone meal	3.00	3.00	3.00
Lysine	0.25	0.25	0.25
Methionine	0.25	0.25	0.25
Salt	0.25	0.25	0.25
Additive*	0.25	0.25	0.25
Total	100.00	100.00	100.00
Calculated chemical composition			
Crude protein (%)	18.82	18.82	18.82
Crude fibre (%)	7.91	7.91	7.91
Ether extract (%)	4.39	4.39	4.39
Metabolizable energy (Kcal/kg)	2324.3	2324.3	2324.3

*Additive – 625 g, detoxizyme – 125 g, superliv -125 g, prebiotics and probiotics - 62.5g, herbo-methionine - 125g, limestone (carrier) - 187.5 g.

Results and discussion

The results of the performance of pigs fed fermented palm kernel cake diets are shown in Table 2. There were no significant differences found in the final live weight, daily feed intake, daily weight gain, feed conversion ratio and feed cost per kg live weight gain for the three different treatments. This shows that within this study, the fermentation process did not improve the nutritive value of PKC.

Table 2 Performance of the experimental pigs fed fermented PKC diets.

Parameters (kg)	TA	TB	TC	SEM
Initial live weight	18.13	20.10	19.64	0.765
Final weight	34.70	36.34	36.67	1.220
Daily weight gain (g)	16.59	16.24	19.53	2.090
Feed conversion ratio	4.24	4.63	3.88	0.356
Feed cost (₦/kg)	92.33	92.33	92.33	0.00
Cost of feed consumed (₦)	4713.75	5061.90	5009.34	104.61
Feed cost/kg weight gain (₦)	391.50	427.49	358.24	27.90

TA - Unfermented palm kernel cake), TB - PKC fermented in water, TC - PKC fermented in sugar solution

Conclusion

In this study the results of the experiment showed that the fermentation technique (fermentation in water or with sugar solution) did not significantly improve the nutritive value of PKC. The experimental diets however did not exert any adverse effects on performance of pigs.

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