ISSN 1996-3343

Asian Journal of Applied Sciences

http://knowledgiascientific.com

Knowledgia SCIENTIFIC
A Place to Publish Outstanding Research

Asian Journal of Applied Sciences 4 (8): 794-800, 2011
ISSN 1996-3343 / DOI: 10.3923/ajaps.2011.794.800

Effects of Sun-dried Cassava Peels Supplementation on the Performance of Weaner Pigs

O.O. Ekwe, B.O. Nweze and E.N. Uchewa
Department of Animal Science, Faculty of Agriculture and Natural Resource Management, Ebonyi State University, P.M.B. 053, Abakaliki, Nigeria

Corresponding Author: O.O. Ekwe, Department of Animal Science, Faculty of Agriculture and Natural Resource Management, Ebonyi State University, P.M.B. 053, Abakaliki, Nigeria Tel: 07035054649

ABSTRACT

The study was carried out to evaluate the effect of sun-dried cassava peels supplementation on the performance of weaner pigs. To realize this objective, twenty-four crossbred weaner pigs weighing averagely 8.5±2.5 kg were used for the study. They were allocated into four treatment groups with three replicates in a completely randomized design. Feed intake, live weight and weight gain were determined using weighing scale (2.5 kg Salter scale) while feed conversion ratio was determine by simple ratio of weight gain/feed intake (kg). The results from the analysis of variance showed no significant ($p>0.05$) differences in the efficiency of feed utilization among the test diets, even though diet 4 had the best feed efficiency. The control diet was superior to other diets in the feed intake measurements. The body anthropometric measurements (BAM) were determined using designer's measuring tape. This parameter (BAM) followed the same trend as in the feed intake except in body weight which excelled in diet 4. In terms of economy and cost benefit, diet 3 was the cheapest followed by diet 1, 2 and 4. Dietary inclusion of DCP and whole maize at 30 and 20%, respectively resulted in better economics of production. Diet 4, with high content of maize, had the best feed conversion efficiency but failed to promote the most profitable pig growth. Although, diet 3, with 30% DCP and 20% whole maize was less efficient in promoting growth, it was the most cost effective and increased profitability because 30% DCP and 20% whole maize are cheaper than 50% dried cassava peels as ingredients for weaner pig rations.

Key words: Feed evaluation, dried cassava peels, whole maize, weaner pigs, performance

INTRODUCTION

It has been established that pig performance in terms of weight and efficiency of gain and carcass leanness is clearly related to the intake levels and therefore intake of particular nutrients, particularly energy and protein. However, feed stuffs and ingredients used in pig ration formulation such as maize, soyabean meal, groundnut cake etc have continued to be scarce and costly due mainly to their low production and competition as food by human beings in Nigeria. This has caused the collapse of many small and large scale pig enterprises, discouraging prospective farmers and curtailing further expansion of small backyard piggeries. Nevertheless, the potential of many industrial by-product such as cassava peels, palm kernel meal, brewers spent grains, wheat offal etc., to serve as alternative, cheaper and readily available nutrient source for pigs has been recognised but not fully utilized (Nwakpu *et al*., 1999).

It is in realization of the above intention coupled with the increased capital and foreign exchange rate that farmers and feed manufacturers are now changing their operations towards grater reliance on locally available feed stuffs (Bratte *et al.*, 2011). Over the years cassava products have long been used as a major source of energy in place of cereal grains by both man and his livestock (Ikurior and Akem, 1998). It is not likely that, there would be a decrease in such competition even in the new millennium.

Now that more people have realized the potentials of pig as quick source of animal protein with the following attributes: high litter size, short generation interval, high growth rate, high prolificacy, ability to convert kitchen waste into nutritious meat; there is every need to find ways of utilizing some of the domestic wastes like cassava peels in formulating swine diets (Oke, 1978; Marire *et al.*, 1997; Sriroth *et al.*, 2000).

This study was therefore, planned to determine the growth performance of wearner pigs fed diets containing dried cassava peals and whole maize in various proportions.

MATERIALS AND METHODS

Study site: The study was conducted at the piggery unit of Micheal Okpara College of Agriculture Umuagwo-Owerri, Imo State-Nigeria. The site has a standard piggery house with open sides covered with nets, concrete floor and roofed with asbestos roofing sheets. Each of the pens measuring 2×7 m has feeding and watering arrangements.

Experimental animals: Twenty-four crossbred wearner pigs weighing averagely 8.5±2.5 kg were used. There were allocated into four treatment groups with three replicates in a completely randomized design.

Experimental diet: Four experimental diets were formulated using whole maize and sun-dried cassava peels in various proportions. Diets 1, 2, 3 and 4 contained 50, 40, 30 and 20% of cassava peels, 0, 10, 20 and 30% of whole maize, respectively. Diet 1 with 50% dried cassava peels and 0% whole maize was the control diet. Other ingredients used in the diets are shown in Table 1. All the pigs were ear-tagged for easy identification and they were treated against ecto and endo parasites using Ivomec at 0.5 mL kg^{-1} body weight prior to the commencement of experiment. There were six pigs per treatment and each treatment was replicated three times with two pigs per replicate.

Cassava peels: The cassava peels used were collected free from Mgbirichi cassava processing plant near Owerri Capital territory, sun-dried for seven days before grinding. Other feed ingredients were bought from the open market at Owerri. The main source of protein was toasted full fat soyabean meal and fishmeal. The proximate composition of the diets is shown in Table 1 which was determined according to AOAC (1990) method of analysis.

Feeding and collection of data: The pigs were weighed at the beginning of the experiment to obtain their initial life weight and subsequently weighed on weekly basis. They were fed twice daily, in the morning by 8.00 am and in the evening by 5.00 pm. Feed intake was obtained as the difference between quantity offered and quantity left over. Water was offered *ad-libitum*. The parameters studied were live weight; weight gain on a weekly basis, feed intake, body length, heart girth and height at withers. The cost of 50 kg bag of each of the feed ingredients at the time of purchase was used to calculate the cost of the experimental diets.

Table 1: Percentage composition of the experimental diets

	Diets			
Item	1 (control)	2	3	4
Ingredients				
Dried cassava peels	50	40	30	20
Whole maize (white)	0	10	20	30
Palm kernel cake	15	15	15	15
Wheat bran	10	10	10	10
Full fat soyabean meal	10	15	15	15
Fishmeal (fish dust)	5	5	5	5
Bone meal	4.00	4.00	4.00	4.00
Salt	0.50	0.50	0.50	0.50
Premix*	0.50	0.50	0.50	0.50
Total % (calculated)	100.00	100.00	100.00	100.00
Determined analysis (%DM)				
Dry matter	89.70	86.20	86.00	89.20
Crude protein	20.30	20.70	20.94	20.95
Crude fibre	9.20	7.35	6.05	5.73
Ether extract	5.20	6.20	7.20	7.80
Ash	6.90	7.80	8.20	8.80
Nitrogen free extract	58.40	57.95	57.60	56.68
ME kcal kg^{-1} (calculated)	2590.00	2610.00	2630.00	2650.00

*Roche vitamin premix containing the following per kg: Vit A 9,600 I.U, Vit D3 1,600 I.U, Vit K 1.6 mg, Vit B 10.9 mg, Vit B2 3.2 mg, Nicotinic acid 12.0 mg, Vit B6 1.6 mg, Vit b12 8.0 mg, Folic acid 0.4 mg, Biotin 0.6 mg Choline Chloride 16.0 mg, Manganese 8.0 mg, Iron 4.0 mg, Zinc 46.88 mg, Copper 8.0 mg, Iodine 0.48 mg Cobalt 0.28 mg, and Selenium 0.01 mg

Statistical analysis: All data collected were subjected to analysis of variance according to the procedure for a Completely Randomized Design (Steel and Torrie, 1980). Mean differences where applicable were separated using Duncan Multiple Range test (DMRT). The statistical model use was as follows:

$$X_{ij} = \mu + T_i + e_{ij}$$

Where:

X_{ij} = Observation on the parameters e.g., the jth body weight of pig receiving the jth diet
μ = Observation of the population mean
T_i = Treatment effect i.e. effect of the ith treatment
e_{ij} = Random error in the observation in the ij group

RESULTS AND DISCUSSION

The performance characteristics as affected by different proportion of dried cassava peels and whole maize in the diets are shown in Table 2. The feed intake data of diets 2 (1.35±0.03), 3 (1.43±0.03) and 4 (1.33±0.03) were similar but the values were statistically ($p<0.05$) lower than diet 1 (1.55±0.03) (Control). This may have been due to high fibre content of the test diets (Table 1) which has been known to occur with dried cassava peels resulting in greater water intake (Akiba and Matsumoto, 1982). This indicated that high fibre diet with corresponding high energy level as in cassava peels affect the feed intake in pig.

Table 2: Performance of weaner pigs on different treatment diets

	Diets			
Parameters	1 (control)	2	3	4
Weekly weight gain (g)/pig	532±0.31	561±0.05	554±0.61	495±5.51
Feed conversion ratio (FCR)	3.95	3.82	3.70	4.28
Feed cost/kg gain (N)	9.05	9.11	9.01	10.00
Feed intake/day/pig	1.55±0.03^{a}	1.35±0.03^{b}	1.43±0.03^{b}	1.33±0.03^{b}

Mean in a row with different superscripts are significantly different ($p<0.05$)

Table 3: Performance of body anthropometric measurement of the experimental diets

	Diets			
Parameter	1 (control)	2	3	4
Body weight (kg)	22.01±1.51^{c}	19.72±0.72^{d}	22.40±1.38^{b}	24.44±0.87^{a}
Body length (cm)	97.63±2.52^{a}	80.07±1.98^{c}	97.37±1.80^{a}	89.94±2.38^{b}
Height at withers (cm)	50.00±0.87^{a}	41.82±1. 07^{d}	48.38±1.07^{b}	46.38±2.38^{c}
Heart girth (cm)	70.00±1.67^{a}	59.92±2.03^{d}	65.40±0.87^{c}	68.14±2.01^{b}

Mean in a row with different superscripts are significantly ($p<0.05$) different

Nevertheless, the growth performance criteria were not significantly ($p>0.05$) influenced by inclusion of dried cassava peels in the diet of wearner pigs up to 50% levels in the control diet. This is indicated in the weight gain (g) per pig per week even though, diet 2 tended to have higher weight gain (561±0.05). The same trend was observed in the feed conversion ratio which has diet 4 (4.28) as the best, although, no statistical difference was observed among the test diets (Table 2). The body anthropometric measurements (Table 3) like body length, heart girth, height at withers and live weight showed highly significant ($p<0.01$) differences among the test diet with diet 1 (22.01±1.51) kg appearing to be the best in all the body parameters, except for live weight where diet 4 (24.44±0.87) kg excelled others with 19.72±0.72, 22.40+1.38 kg for 2 and 3, respectively.

Result indicated greater feed intake in the control diet of 50% dried cassava peels and 0% maize, portraying a lowered energy concentration of dried cassava peels than maize grains. This suggest a greater feed intake of the pigs in an attempt to meet-up with their metabolisable energy requirements by consuming more feed and perhaps drinking more water (ARC, 1981; NRC, 1998; Low, 1985). However, increased feed intake of pigs on control diet 1 was not accompanied by higher growth rate over and above other test diets. Coffey *et al.* (1982) suggested that increased fibre content of diet depressed growth rate in pigs especially during periods of high temperature and this is prevalent in the tropics. Fibrousnesses, has also been reported by Longe and Fagbenro-Byron (1990) as a feature of most locally available agro-industrial by-products and waste that limit their use. Again, the physical bulk may affect the overall retention time of digest in the gastro-intestinal tract and consequently, their utilization (Stanogias and Pearce, 1985a; Eruvbetine, 1995).

The observation of lack of significance of dietary treatments and efficiency of weight gain agrees with the works of Muller *et al.* (1974). These workers carried out a preliminary trial on the value of dried cassava peels, in which 13% moist cassava peels at 40-50% levels of diet were fed to pigs and discovered no statistical differences in the live weight gain and feed conversion efficiency between low and high cassava diets.

These workers had earlier suggested greater digestibility of cassava based diets than cereal (maize) by pigs. Nevertheless, the rate and efficiency of gain was not commensurate with feed intake levels and this goes to support the earlier opinion of Blair *et al.* (1969) who upheld that, the efficiency of feed conversion in pigs has been found to be inversely related to increased feed intake levels because high intake allows for increased body fat deposition and body fat deposition require more energy than protein (muscle) deposition for the same unit increase in body weight (Hammond *et al.*, 1971).

The significant differences observed among the pigs in the rate of development of the body anthropometric measurements like body weight, body length, height at withers and heart girth, goes to point at the genotypes of the animals. Since, the experimental animals were hybrids of large white and landrace genotypes, differences in their body shapes and sizes were expected and could not be attributed solely to dietary treatments. Results also suggested further use of pure breeds in testing these feed ingredients. Also, environmental interaction on the rate of body development of these genotypes, would have been similar since these genotypes have been conferred some elements of adaptability in their environment. Generally, the best performance was obtained from diets four, three, one and two, in that order. This was indicated in their live weight development which had significant differences observed in the treatment. The significant differences observed in the body weight development also agreed with Stanogias and Pearce (1985b) who replaced maize with moist cassava peel meal and discovered that pigs on diets containing cassava peel meal grew slightly but not significantly faster and were slightly more efficient in feed conversion than pigs on diets with maize. The increase in the feed intake of diets high in cassava meal goes to confirm the positive trend observed in the rate of gain and efficiency. This is because, pigs tend to eat more and add more weight (fat), especially when the diets is diluted with fibrous feed ingredients (Stanogias and Pearce, 1985b).

Economics analysis: Table 2 shows the economics of feeding dried cassava peels and whole maize to wearner pigs in different proportions. Even though the cost of feed per kg gain was not statistically different among the test diets, diet 3 (N9.03) had the least feed cost per kg gain followed by diets 1 (N9.05) (Control) and 2, (N9.11) while diet 4 (N10.00) had the highest cost. It could also be observed that, diet 4 had the best feed conversion ratio but the highest cost per kg gain, pointing that, an efficient feed conversion ratio is not a criterion for higher profit especially if this is obtained from costly diets. This observation reflects the real quality or production value of the test diets for growing pigs which is closely associated with feed utilization as reported by Ikurior (1993).

Despite the fact that, pigs on control diet consumed more of the relatively cheap diet, the diets could not effectively justify good growth. Although, Phillips (1984) reported that reducing feed cost was not only to obtain cheaper feed; but also dependent on production value. The result of this work justified the fact that, huge financial returns would be made when wearner pigs are fed with dried cassava peels at 30 and 20% of whole maize.

Economics analysis: Table 2 shows the economics analysis of feeding dried cassava peels and whole maize to wearner pigs in different proportions. The cost of feed ingredients at the time of purchase was used to calculate the total cost of feed per 100 kg (weight per bag of the ingredients). The cost of the diets was determined by dividing the cost of one bag of feed by 25 kg (weight of a bag of feed).

Cost benefit: Cost benefit was determined by calculating and comparing the cost per kg gain (N/kg) of the various treatment groups.

Body weight: Body weight and feed intake were determined using weighing scale (2.5 kg Salter Scale) while weight gain were calculated by subtracting the initial weight from the final weight and dividing by the period the experiment lasted.

Feed intake: Feed intake was determined using a weigh back method; a difference was derived between the feed offered and the left over.

Body anthrometric measurement: Body length, heart girth and height at wither were obtained using designer's tape.

CONCLUSION

The results of this study is a serious pointer that feeding dried cassava peels solely up to fifty percent can achieve equal or more positive effects than using high level of maize in diet of wearner pigs. This observation appears to be an encouraging venture considering the prohibitive costs of maize grains in our market today; one would have felt that, the best next energy source is dried cassava peels. This is even more encouraging when one realizes that these peels are waste by-products in most of our garri processing centres coupled with the pollution resulting from the decomposition of these peels around our homes, in towns and cities.

ACKNOWLEDGMENT

Sincerely acknowledge Dr. P.E. Nwakpu (Assoc. professor of Animal Nutrition whose work on Supplementation of Cassava Peel Meals for maize on diets for growing pigs gave us a good support for literatures used during the investigation). I also thank Dr. A.A. Anyehie of Imo State University for his advice and Prof. F.C. Obioha of University of Nigeria Nsukka who gave me advice on how to go about the processing of the cassava peels used for the work.

REFERENCES

AOAC, 1990. Official Methods of Analysis. 15th Edn., Association of Official Analytical Chemists, Washington DC. USA., pp: 200-210.

ARC, 1981. The Nutrient Requirement of Pigs: Technical Review. Vol. 22, Commonwealth Agricultural Bureax, England, UK., pp: 307.

Akiba, Y. and T. Matsumoto, 1982. Effect of dietary fibres on lipid metabolism in liverand adipose tissue in chicks. J. Nutr., 112: 1577-1585.

Blair, R., J.B. Dent, P.R. English and J.R. Raeburn, 1969. Protein lysine and feed intake levels on pigs growth. II. Effect on carcass composition quality. J. Agric. Sci., 73: 395-415.

Bratte, L., I.A. Amata, S.I. Omeje and G.N. Egbunike, 2011. The effects of partial replacement of dietary maize with seeds of the African pear (*Dacryode edulis* G. Don, H.J. Lam) on semen characteristics of broiler breeder cocks. Asian J. Anim. Sci., 5: 71-79.

Coffey, M.T., R.W. Seerley, D.W. Funderburke and H.C. McCampbell, 1982. Effect of heat increment and level of dietary energy and environmental temperature on the performance of growing-finishing swine. J. Anim. Sci., 54: 95-105.

Eruvbetine, D., 1995. Processing and utilization of cassava as animal feed for non ruminant animals. Paper Presented at the Workshop on Alternative Feedstuffs for Livestock Organized by the Lagos State Ministry of Agriculture and Co-operative and Rural Development, Lagos, Nigeria.

Hammond, J. Jr., I.L. Mason and T.J. Robinson, 1971. Hammonds Farm Animals. 4th Edn., Edward Arnolds Publishers Ltd., London.

Ikurior, S.A., 1993. Replacement of dietary soyabean meal protein with that from roasted or cooked full-fat soyabean for wearner-grower pigs. Trop. Oil Seed J., 1: 90-97.

Ikurior, S.A. and J.D. Akem, 1998. Replacing maize with cassava root meal or its mixture with brewers yeast slurry in rabbit diets. Nig. J. Anim. Prod., 25: 31-35.

Longe, O.G. and V. Fagbenro-Byron, 1990. Composition and some physical characteristics of some fibrous wastes and by-products for pig feed in Nigeria. Bietr. Trop. Landarietsch Vet. Med., 28: 199-205.

Low, A.G., 1985. The role of dietary fibre in digestion, absorption and metabolism. Proceedings of the 3rd International Seminar on Digestive Physiology in the Pig, May 16-18, Copenhagen, Denmark, pp: 156-179.

Marire, B.N., S.O.C. Ugwu, F. Ogah and P.E. Nwakpu, 1997. Growth characteristic of local and exotic boars unser the same management conditions. Nig. Vet. J., 18: 228-233.

Muller, Z., K.C. Chou and K.C. Nah, 1974. Cassava as a total substitute for cereals in livestock and Poultry rations. World Anim. Rev., 12: 19-35.

NRC, 1998. Nutrient Requirements of Swine. 10th Edn., Natl. Acad. Press, Washington, DC.

Nwakpu, P.E., S.S.I. Omeje and B.I. Odo, 1999. Performance of wearner pig fed diet containing different proportion of derided cassava peel and whole maize. Trop. J. Anim. Sci., 2: 81-87.

Oke, O.L., 1978. Problems in the use of cassava as animal feed. Anim. Feed Sci. Technol., 3: 345-380.

Phillips, G.D., 1984. Feed utilization: Principles and new developments in physiology. Can. J. Anim. Sci., 64: 543-549.

Sriroth, K., R. Chollakup, S. Chotineeranat, K. Piyachomkwan and C.G. Oates, 2000. Processing of cassava waste for improved biomass utilization. Bioresour. Technol., 71: 63-69.

Stanogias, G. and G.R. Pearce, 1985a. The digestion of fibre by pigs. 1. The effects of amount and type of fibre on apparent digestibility, nitrogen balance and rate of passage. Br. J. Nutr., 53: 513-530.

Stanogias, G. and G.R. Pearce, 1985b. The digestion of fibre by pigs. 3. Effects of the amount and type of fibre on physical characteristics of segments of the gastrointestinal tract. Br. J. Nutr., 53: 537-548.

Steel, R.G.D. and J.H. Torrie, 1980. Principles and Procedures of Statistics: A Biometric Approach. 2nd Edn., McGraw Hill Book Co. Inc., New York, USA., ISBN-13: 9780070610286, pp: 188-189.