PJN
ISSN 1680-5194

PAKISTAN JOURNAL OF NUTRITION

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Pakistan Journal of Nutrition 6 (3): 264-266, 2007
ISSN 1680-5194

Assessment of the Practical Potential of Bambara (*Voandzeia subterrenea* Thouars) Waste for Weaner Pigs

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Abstract: Twenty four Large White x Landrace weaner pigs averaging 6.72+0.04kg at 8th week of age were used in a 56 days feeding trial to assess the feeding potential of Toasted Bambara Waste (TBW) fed at 0, 5, 10 and 15% levels. The diets were formulated to contain 18% crude protein and 2800kcal ME/kg. The pigs were randomly allocated to four treatments according to weight, sex and litter-mates with three replicates per treatment and two pigs per replicate. Results show that the final body weight of pigs on the control diet (0% TBW) were comparable (P>0.05) to those of pigs on the 10% TBW levels. The efficiency with which the pigs on 10% level of TBW utilized the diet was not significantly different from those of pigs on the control diet (P>0.05). The economy of feed conversion showed that the lowest feed cost per kg live weight gain was observed for pigs on the 10% TBW diet. Haematological evaluation further revealed that pigs on the 10% TBW diet had the highest red blood cells count which differed significantly (P<0.05) from the other treatments. It is concluded that weaner pigs can tolerate diets with up to 10% level of toasted bambara waste with better performance and cost benefits.

Key words: Assessment, bambara waste, weaner pigs

Introduction

Bambara nut (*Voandzeia subterrenea*) is a non-oily leguminous seed which contains only about 6% of ether extract. It contains an appreciable amount of lysine and minimum amount of trypsin and chymo-trypsin (Oyenuga, 1968). According to Enwere (1998), Bambara nut has the following composition; moisture, 9.7%, crude protein, 16.0%, crude fat, 5.9%, Ash 2.9%, Total carbohydrates, 64.9%. It is fairly well supplied with Calcium and Iron though poor in phosphorous. It contains thiamine, riboflavin, niacin and carotene but very low in ascorbic acid (Oyenuga, 1968). Bambara nut is mainly processed into flour which is prepared and consumed in a form popularly called 'okpa' among the Ibos of Nigeria (Enwere, 1998). In order to produce the flour, the seed coats are partially removed by splitting the seeds in attrition mill, winnowing to remove loosened testa and converting the cotyledon into fine flour by milling several times in a hammer mill or any other type of mill followed by sieving, using sieves with 1mm pores. Processing of Bambara nut results in fairly large inedible portion being discarded as wastes. This inedible portion had been fed in-discriminately to livestock and used as soil manure. Presently, there is scarcity of information in the literature on the utilization of Bambara waste by pigs. The fact that 'okpa' remains a staple protein meal in most homes in Eastern Nigeria assures the availability of Bambara waste as a potential feeding stuff in the diets of pig. It is based on this premise that we decided to evaluate the utilization of Bambara waste by weaner pigs.

Materials and Methods

Location and Duration of study: The experiment was conducted at the Pig Research and Training Unit of the Department of Animal Science, University of Nigeria, Nsukka. The town is in the dried savannah zone. Climate of the study area is specially tropical with relative humidity ranging from 65-85%. The rainy season is between April-October.

Source and processing of test ingredient: The test ingredient, bambara waste, was purchased from processing plants in Nsukka and Orba, Enugu State. It was toasted over fire using frying pans for 20 min and subsequently incorporated into diets of weaner pigs.

Experimental diets: There were four dietary treatments in which bambara waste was incorporated at 0, 5, 10 and 15% levels. The diets were formulated to contain 18% crude protein and 2800kcal ME/kg (Table 1). As the level of Bambara waste in the diets increased, maize and soyabean levels decreased.

Experimental procedure: Twenty-four Large White X Landrace pigs averaging 6.72±0.04kg at eight weeks of age were used for the trial. The pigs were randomly allocated to four treatments according to weight, sex and litter mates with three replicates per treatment and two pigs per replicate. The feeding trial lasted for 56 days. Feeding was done twice daily at 8.00h and 16.00h. Pigs received 4% of their average body weight as ration per treatment. Water was provided *ad libitum*. Body weight of each pig was determined at the start of the trial and subsequently on a weekly basis.

Table 1: Percentage composition of the Diets

Ingredients	Dietary levels of Bambara waste (Treatments) 1 (Control)	2 (5%)	3 (10%)	4 (15%)
Maize	30.0	28.0	25.0	20.0
Maize offal	25.0	25.0	25.0	25.0
Bambara waste	–	5.0	10.0	15.0
Soyabean meal	20.0	17.0	15.0	15.0
Palm kernel cake	20.0	19.0	19.0	19.0
Fish meal 1.25	2.25	2.25	2.25	
Bone meal	3.0	3.0	3.0	3.0
Salt	0.50	0.50	0.50	0.50
Vitamin mineral Premix[a]	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00
Calculated				
Crude protein	17.90	17.66	17.34	17.74
Crude fibre	6.04	6.79	7.71	8.71
Energy kcal ME/kg	2815	2779	2765	2734

Supplied per kg of Diet: 5000IU vit. A; 1,000,000IU vit. D_3; 800mg Vit. E; 400 mg vit K; 1,200mg vit. B2; 1,000mg vit. B3; 4mg vit. B12; 3,000mg Niacin, 4,000mg vit. C; 112,000mg chlorine, 24,000mg Mn; 8,000mg Fe; 1,600mg Cu; 18,000mg Zn; 500mg Iodine; 48mg Selenium; Antioxidant (BHT).

Table 2: Proximate composition of the diets and toasted bambara waste

Composition	Dietary treatments 1	2	3	4	TBW
Dry matter	94.23	95.67	94.81	94.88	92.00
Crude protein	18.92	18.76	19.36	18.30	17.00
Ether extract	5.52	5.28	4.90	4.35	4.50
Crude fibre	6.99	9.43	10.88	11.16	21.40
Ash	6.04	7.40	8.40	7.67	3.50
N-Free extract	62.53	59.13	56.46	53.40	53.60

Parameters determined: The following parameters were measured; average daily feed intake (kg), average daily gain (kg/day), protein efficiency ratio, feed conversion ratio (feed/gain) and feed cost/kg gain (N).

At the 56 day of the feeding trial, blood was sampled from two pigs per treatment by humane puncture of the tail vein. The blood samples were separately collected using sterile disposable syringes and needles into bottles containing Ethylenediaminetetracetic acid. Packed Cell Volume (PCV), Red Blood Cells (RBC), White Blood Cells (WBC) were determined according to the method of Davie and Lewis (1975). The Mean Corpuscular Haemoglobin Concentrations (MCHC), Mean Corpuscular Haemoglobin (MCH) and Mean Corpuscular Volume (MCV) were calculated as follows:

MCHC (%)= Hb / PCV x 100

MCH (μμg) = Hb / RBC x 10

MCV (cμμ) = PCV / RBC x 10

Statistical analysis: All data obtained were processed and subjected to analysis of variance (ANOVA) for a completely randomized design according to the method of Steel and Torrie (1980). Significantly different means were separated using Duncan's Multiple Range Test (Duncan, 1955).

Table 3: Performance of Weaner Pigs Fed Varying Levels of Bambara Waste

Parameters	Dietary Levels of Bambara Waste 0	5	10	15	SEM
Initial Body Weight (kg/pig)	6.75	6.75	6.75	6.88	0.083
Final Body Weight (kg/pig)	18.08^{b}	15.75^{a}	17.58^{b}	15.17^{a}	0.758
Body Weight gain (kg/pig)	11.33^{b}	9.00^{a}	10.83^{b}	8.29^{a}	0.543
Feed Intake (kg/pig)	27.44^{b}	24.08^{a}	26.88^{b}	24.08^{a}	0.037
Feed Conversion Ratio	2.42^{a}	2.68^{b}	2.48^{a}	2.91^{c}	0.047
Protein Efficiency Ratio	2.18	1.99	2.08	1.79	0.079

^{abc}Mean values in a row with different superscripts are significantly different (P <0.05). SEM: Standard Error of Mean

Table 4: Economics of feeding varying levels of Bambara waste on Weaner Pigs

Parameters	Dietary Levels of Bambara Waste 0	5	10	15	SEM
Cost/kg of feed (N/pig)[1]	35.53	33.20	30.70	28.70	ND
Cost of feed consumed (N /pig)[2]	974.94	799.46	825.22	691.10	ND
Feed cost/kg Gain[3]	85.98^{b}	88.98^{b}	76.14^{a}	83.52^{b}	0.008

[1]Calculated from the prevailing prices of the component feeding stuffs in Table 1 as @ September 2006.

[2]Cost/kg of feed multiplied by feed Intake

[3]Cost/kg of feed multiplied by the Feed Conversion Ratio

The Naira exchange presently @ N128 to 1 US Dollar

Table 5: Haematological values of weaner pigs fed 0, 5, 10, 15 percent levels of toasted bambara waste

Parameters	Dietary Levels of Bambara Waste 0	5	10	15	SEM
Hb (g/100ml)	11.40	11.35	11.90	11.25	3.762
PCV (%)	40.50^{c}	38.50^{b}	37.50^{b}	7.40^{a}	0.408
RBC (x 10^6/mm^3)	6.60^{a}	6.91^{a}	8.45^{b}	7.40^{a}	1.172
MCHC (%)	28.14^{a}	29.49^{a}	31.72^{b}	34.62^{b}	1.726
MCH (u.u.g)	17.30	16.44	14.09	15.21	0.609
MCV (cuu)	61.69^{c}	55.74^{b}	44.39^{a}	43.96^{a}	2.923
WBC (x10^3/mm^3)	23.50^{c}	12.90^{a}	15.09^{b}	26.00^{d}	0.276
Neutrophils (%)	36.50^{b}	33.00^{a}	45.50^{c}	35.00^{ab}	0.500
Lymhocytes (%)	57.00	59.50	61.00	49.00	0.935
Monocytes (%)	5.50^{b}	4.00^{a}	4.00^{a}	3.00^{a}	0.204
Eosinophils (%)	1.00	2.00	2.00	2.50	0.081

^{abcd}Mean values in a row with different superscript are significantly different (P<0.05). SEM: Standard errors of mean

Chemical analysis: Proximate analyses of the Bambara waste and the diets were performed according to the methods of AOAC (1990) Table 2.

Results

Table 3 shows data on the performance of pigs in this experiment. Treatment effect on final body weight, Body weight Gain, Feed Intake and Feed conversion Ratio were significant (P<0.05). Pigs on the 0% TBW (control) diet did not differ from the group on the 10% TBW diet in their final Body weight, Body weight Gain, Feed Intake and Feed Conversion Ratio (P>0.05). However, they differed from values obtained for pigs on the 5 and 15% TBW diets (P<0.05). Pigs on the 5 and 15% TBW diets had statistically similar values in these parameters (P>0.05).

Table 4 shows the economics of feeding varying levels of TBW on weaner pigs. The cost/kg of feed progressively reduced as the level of TBW in the diets was increased. The feed cost/kg of gain of pig on the 10% TBW diets was significantly different from the values obtained for pigs on the other treatments.

Table 5 shows data on hematological measurements of pigs in this experiment. The effect of treatment on PCV, RBC, MCHC, MCH, MCV, WBC, Neutrophils and Monocytes were significant (P<0.05). Results showed that PCV values progressively decreased as the level of TBW in the diets increased. Pigs on the 10% TBW diet had significantly higher RBC value from values obtained for pigs on the other treatments (P<0.05). On the other hand, pigs on the 15% TBW diet had significantly higher value of WBC (P<0.05). Neutrophil values of pigs on the 10% TBW diet were significantly higher than values obtained for pigs on the other treatments (P<0.05).

Discussion

Results indicated that pigs on the 10% TBW compared favourably with the control pigs in the performance parameters measured. The superior performance of pigs on the 10% TBW diet could be as a result of their better ability to utilize dietary nutrients, including crude fibre. Pig's performance in terms of rate and efficiency of gains is closely related to the nutrient intake levels, especially protein and energy (Fetuga *et al.*, 1995). This ability to utilize dietary nutrients elicited superior body weights which in turn positively influenced the digestive ability of the pigs. This view agrees with the report of Cunningham *et al.* (1962) that increasing the live weight of pigs increased the digestibility at all levels of fibre. The source of the crude fibre may also have enhanced its utilization by the pigs. There is evidence in the literature that there is a distinctly larger negative influence of crude fibre originating from cereals (2.1-3.5) than from leguminous plants (0.5-2.2%) in the case of energy digestibility (Ehle *et al.*, 1982). It is also probable that the common processing techniques for Bambara nut such as grinding and heat treatment employed in this study have the ability to modify the nutritive value of the Bambara waste thus ensuring more nutrient availability to the pigs. This view is in harmony with the report of Just (1982) that common processing techniques such as grinding, heat treatment, pelleting etc could modify the nutritive value of diets. Data on economics of feeding shows that cost/kg of feed decreased progressively as level of the Bambara waste in the diets increased. This is understandable as the Bambara waste, which is comparatively cheap, replaced the more expensive maize and soyabean meal in the diets. The values obtained for feed cost/kg gain further suggests that 10% level of inclusion is the optimal level of TBW in the diets of weaner pigs. Results indicated that the haematological values examined come within the normal range for pigs as recommended by Coffin (1975). The highest value of red blood cells count of pigs on the 10% TBW diet further supports the view that the feed quality at this dietary level is superior. This finding agrees with earlier report of Clarke and Myra (1957) that red blood cells count is an indication of feed quality.

Conclusion: The inclusion of up to 10% Bambara waste in the diets of weaner pigs will help produce cheaper and affordable pork. Pig farmers are encouraged to use this level of Bambara waste in compounding rations for their weaner pigs.

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