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Growth Performance and Hematological Traits of Weaner Pigs Fed Graded Levels of Raw Bambara Nut (*Vigna Subterranean (L) Verdc*) Waste.

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Abstract
Sixty Weaner pigs with an average initial live weight of 6.81 ± 1.0kg were studied for their growth and haematological parameters when fed graded levels of raw bambara waste (BW) using a completely randomized design (CRD). They were fed five diets containing 0, 25, 50, 75 and 100 percentage composition for 5 months. Live weight gain, final body weight, feed intake, feed conversion ration (FCR), protein efficiency ration (PER), cost of daily feed intake and cost of feed per kg weight gain were determined. Packed cell volume (PCV), red blood cell (RBC) count, white blood cell (WBC) count, haemoglobin concentration (Hb), mean corpuscular volume (MCV), mean corpuscular haemoglobin concentration (MCHC) and mean corpuscular haemoglobin (MCH) were also measured. There were significant (P<0.05) differences among treatments in feed intake, weight gain, final body weight, cost of daily feed intake and cost of feed per kg weight gain. Pigs fed 0, 25 and 50% bambara waste diets had significantly higher (P<0.05) feed intake and cost of feed per kg weight gain than those fed 75 and 100% raw bambara waste diets The lowest (P<0.05) cost of daily feed intake was observed in treatment 5 (100% raw bambara nut waste). There were no significant (P > 0.05) differences among treatments in haematological parameters. The results of the study indicate that up to 100% raw bambara nut waste can be included in the rations of weaner pigs without any adverse effect on performance.

Keywords: Growth Performance, Bambara nut wastes, Weaner Pigs and Haematology.
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Introduction

The solution to the problem of animal protein shortage in Nigeria lies in the production of fast maturing animals like pigs with the utilization of cheap and locally available feedstuffs in order to produce them at an affordable cost. Pigs have been described as one of the most prolific and fast growing livestock species that can convert food waste to valuable products (Eusebrio, 1984). They excel above other red meat animals, such as cattle; sheep and goats in converting feed to flesh and their animal growth rate (3.8%) is higher than that of the human population (2.3 - 2.8%) (Shaibu *et al*, 1997).

The feeding of concentrate to pigs increased feed consumption and crude fibre digestion (Butcher *et al*, 1981).

The use of conventional protein feed ingredients such as soybean meal and groundnut cake in livestock feeding tends to increase production cost. Therefore, there is need, to find alternative protein source in livestock feeding such as bambara nut waste (BW).

Bambara nut (*Vigna Substerrancea* L.) is an indigenous African grain legume, which is grown for its edible grain. Rachie and Roberts (1974); Wdiokwere (1982) reported that dry bambara nut seeds contained 21.13% crude protein, while the raw bambara

waste contained 16.19% crude protein. In Nigeria, the cultivation of bambara nut is widely distributed in the southern and middle belt states and in most of these states, the dried mature seeds are converted into paste, steamed and eaten in the form of moi-moi (Enwere, 1998). Studies in animal nutrition have shown that bambara nut can be used in the feeding of poultry and rabbits and the waste used in the feeding of pigs (Okeke, 2000; Ani and Okafor, 2004).

Nevertheless, the use of bambara nut and its waste is limited because of the presence of such anti-nutritive factors like cyanogens, flatulence factors, tannins and trypsin inhibitors in raw bambara nut (Ensminger *et al*, 1990).

This study was carried out to determine the effect of feeding graded levels of raw bambara nut waste on the performance and haematological parameters of weaner pigs.

Materials and Methods.

The weaner pigs were crosses of large white and Native pig established and maintained at the piggery unit of Ebonyi State University, Abakaliki, Nigeria. The feedstuffs and ingredients used in the study were purchased from Abakaliki main market and Enugu main market respectively. The ingredients were crushed and used to compound five experimental diets as shown in table 1.

Table 1: Percentage Composition of experimental diets Dietary levels of raw bambara nut waste (%)

Ingredients	0 (control)	25	50	75	100
Maize	40	30	20	10	-
Palm kernel cake	21	21	21	21	21
Wheat offal	25	25	25	25	25
Fish meal	5.0	5.0	5.0	5.0	5.0
Soyabean meal	6.0	6.0	6.0	6.0	6.0
Raw bambara waste	-	10	20	30	40
Bone meal	2.0	2.0	2.0	2.0	2.0
Salt	0.5	0.5	0.5	0.5	0.5
Premix*	0.5	0.5	0.5	0.5	0.5
Total	100	100	100	100	100

*Vitamin A-10,000.00I.V., D3 2000 IV, B1-0.75g, B2-5g, Nicotinic acid-25g, Calcium panthothenate 12.5g, B12-0.015g, K3-2.5g, E-25g, Bistin-0.050g, Folic acid –1g, Manganese 64g, Chlorine chloride 250g, cobalt-0.8g, copper 8g, Iron-32g, Zn-40g, Iodine-0.8g, Favomyani-100g, Spiramyani 5g, DL-Methionine –50g, Selenicum – 0.6g, Lycine 120, BAT-5g.

Experimental Animals and Diets: Sixty crossbred pigs (large white x Native) Weaner pigs, eight weeks old weighing averagely 10.80kg were randomly divided into five groups of twelve pigs each, using a completely randomized design (CRD). Each group was randomly assigned to one of the five iso-nitrogenous and Iso-Caloric diets (1,2,3,4,and 5) containing 0% (control), 10, 20, 30 and 40% raw bambara nut waste (BW) respectively.

Each treatment was replicated three times with four pigs per replicate. The experimental sites was a standard block with open sides covered with net, concrete floor and roofed with asbestos roofing sheets, each pen measuring 4.0x7.5m long, with feeding, drinking and wallowing troughs. Each pen, which accommodated four pigs, was partitioned with wood planks for collection of faecal droppings.

The pigs were provided feed and water *ad libitum* twice daily at 08.00h and 17.00h for 20 weeks of the experimental period. The weaner pigs also received 1kg of fresh farages (*Permisetum purpureum, Centrosema pubescen*) as supplement to the experimental diets. The pigs were weighed at the beginning of the experiment and subsequently on a weekly basis.

Blood Collection and Analysis: During the 20th week of the experiment, two grower pigs were randomly selected from each treatment group and blood samples were collected from their jugular veins with sterile needless.

The blood samples were collected into properly labeled sterilized bottles

containing EDTA (Ethylene diamine tetra-acetic acid) for haematological analysis. Packed cell volume (PCV) and haemoglobin concentration (Hb) were determined by methods described by Lamb (1991). Red blood cell (RBC) and total white blood cell (WBC) counts were estimated using the haemocytometer, while mean corpuscular volume (MCV) and mean corpuscular haemoglobin (MCH) were calculated according to Mitruka and Rawnsley (1977).

Proximate and Statistical Analysis: Experimental diets were analyzed for proximate composition using the methods of A.O.A.C. (1990). Data collected were subjected to analysis of variance (ANOVA) for a completely randomized design (CRD) steel and Torric, (1980) and differences between the treatment means were separated using Duncan's New Multiple Range Test (Duncan 1955).

Results

The growth performance of pigs fed graded levels raw bambara nut waste (BW) is shown in Table 3. Results indicate that, there were significant ($P<0.05$) differences among treatments in final body weight daily. Weight gain and daily feed intake pigs on diets 0, 25 and 50% raw bambara nut had significantly higher ($P<0.05$) feed intake than those on other diets. The pigs placed on 100% raw bambara waste diet had the lowest feed intake ($P>0.05$) but was not lower than ($P<0.05$) that of pigs intake and weight gain of the pigs declined as the level of raw bambara nut waste in the diets increased.

Growing pigs fed 0% (control, 25% and 50% raw bambara nut waste diets had higher ($P<0.05$) weight gain than those on 75 and 100% raw bambara nut waste diets. The final body weight of pigs fed the experimental diets followed the same pattern with daily weight gain (Table 3). There were no significant ($P>0.05$) differences among treatment in feed conversion ratio and protein efficiency ratio.

The cost of feeding graded levels of raw bambara waste to weaner pigs is presented in table 4. Results showed significant ($p<0.05$) differences among treatment in total weight gain, cost of daily feed intake and in cost of fed per kg weight gain. Growing pigs that received 0, and 25% raw bambara nut waste diets showed similar total weight gain with those fed 50% raw BW diets and this was significantly ($P<0.05$) higher than that of pigs fed 75 and 100% raw BW diets.

Pigs fed 75 and 100% BW had significantly lower ($P>0.05$) daily feed cost and cost of feed per kg weight than those on other diets. Results indicated progressive decline in the daily feed cost and in the cost of feed per kg weight gain of pigs.

Table 5 shows the effect of graded levels of raw BW on hematological values of weaner pigs. There were no significant ($p>0.05$) differences among treatment in all the parameters measured.

Table 2: - Proximate composition of the experimental diets

	Dietary levels of raw bambara nut waste (%)				
Ingredients	0	25	50	75	100
Dry matter	96.00	94.00	96.10	97.70	93.20
Crude protein	17.65	15.50	16.80	17.70	18.10
Crude fiber	8.50	13.05	14.50	16.05	16.60
Ether extract	3.50	3.50	4.50	5.05	6.04
Ash	15.50	16.50	17.00	1750	18.10
Nigerian free extract	65.80	59.90	56.70	55.00	48.10
Cross energy (mg/kg)	16.05	16.50	16.10	17.90	18.50

Table 3: - Performance of weaner pigs fed graded levels of raw bambara nut waste

	Dietary levels of raw bambara nut waste (%)					
Parameters	0	25	50	75	100	SEM
Initial live weight (kg)	7.05	6.96	6.76	6.80	6.92	1.05
Final live weight (kg	59.27[b]	61.83[b]	57.17[a]	58.20[bc]	56.50	5.0
Daily weight gain (kg)	0.54[a]	0.53[a]	0.48[b]	0.41b[c]	0.39[c]	0.12
Daily feed intake (kg)	0.43[a]	0.46[a]	0.51[b]	0.53[b]	0.56[b]	0.6
Feed conversion radio	2.01[a]	2.10[a]	2.05[a]	2.20[b]	2.30[b]	0.50
Protein efficiency ratio	2.51[a]	2.42[b]	2.49[b]	2.58[a]	2.61[b]	0.03

A,b,c .means on the same row with different superscripts are significantly different (p >0.05). Sem- standard error of means.

Table 4:- cost of graded levels of raw bambara nut waste to weaner pigs

	Dietary levels of raw bambara nut waste %					
Parameters	0	25	50	75	100	SEM
Total feed intake (	5.30[a]	4.95[ab]	3.96[b]	3,93[b]	2.85[c]	1.30
Cost of feed/kg (N100)	30.10[a]	29.50[a]	28.50[ab]	27.61[bc]	25.41	
Cost of total feed consumed (N1000)	18.47[a]	16.21a[b]	14.20b[c]	11.35[c]	10.38[d]	10.80
Total weight gain (kg)	1.80[a]	0.78[d]	0.71[a]	0.68[b]	0.61[b]	0.50
Cost of daily feed intake (N)	3.98[a]	3.68[b]	2.39[c]	2.49[c]	2.10[c]	0.41
Cost of feed/kg weight gain(N)	186.10[a]	180.20[a]	173.50[ab]	168.10b[c]	150.10[c]	5.0

A,b,c,:- means on the same raw with difference superscript are significantly ($p<0.05$) different. SEM: - standard error of means

Table 5: Effect of raw bambara nut waste on haematogical parameters of weaner pigs

	Dietary levels of raw bambara nut waste %					
Parameters	0	25	50	75	100	SEM
PCV (%)	48.00[a]	47.50[a]	45.20[b]	38.50[c]	33.10[c]	3.81
HB Con(g/100ml)	16.61[a]	15.90[a]	13.30[b]	12.95[c]	12.81[c]	2.10
RBC(mm3x106)	2.81	2.61	2.41	2.30	1.98	0.51
WBC(mm3x103)	28.13[a]	25.81[a]	22.30[b]	20.50[c]	18.31[c]	0.03
MCHC (%)	28.50[a]	26.21[a]	25.33[b]	25.29[c]	24.31[c]	0.81
MCH(%)	8.61	16.31	15.81	15.10	14.81	0.61
MCV(MM2)	64.81[a]	61.30[a]	58.50[b]	55.10[b]	53.20[b]	5.0

[a b,c] means on the same row are not significantly ($p>0.05$) different. SEM: standard error of the means.

Discussion

The feed intake and weight gain of the pigs declined as the level of raw bambara nut waste in the diets increased beyond 50% level of inclusion. The significant depression in feed intake as the levels of raw bambara nut waste increased might have resulted from the actions of the anti-nutritive factors like cyanogens, tannins, and trypsin inhibitors in the raw bambara nut (Liener, 1975). This observation corroborates earlier findings of Ensminger (1990) who indicated that tannins could decrease voluntary feed intake digestibility and weight gain. Again, the significant depression in feed intake may also be attributed to high fibre contents of the diets with higher levels of bambara nut waste.

Fibrous feeds are known to waste longer live in the digestive tract of farm animals thereby regulating in early get-fill and reduced feed intake Mesonald *et al*., (1995).

Feed intake is a major contribution factor that influences weight gain. The decline in weight gain at 75 and 100% inclusion levels of bambara nut waste is a

confirmation of depressed feed intake. This is because, the metabolic and production requirements of the pigs could not be satisfied as the level of raw BW in the diets increased to 75% and 100% with the resultant decline in feed intake which ultimately leads to growth depression (Nwakpu and Omeje, 2002).

Beside, Sklan *et al*. (1975) had earlier maintained that ingestion of raw oil bean meal caused growth inhibition. Though, there was no mortality recorded during the experiment, the presence of anti-nutritive factors especially cyanogenic-glucosides in the raw bambara nut waste might have influenced the concentration and even toxicity levels of the raw bambara nut waste beyond 75 and 100% respectively. Ensminger *et al*., (1990) had also indicated that cyanide (cyanogenic glucosides) is very toxic at low concentrations to humans and even animals. However, pigs have demonstrated that they can handle this waste comfortably and since inclusion levels of bambara nut waste at 100% to replace maize in the diet of pigs has resulted in progressive decline in the daily feed cost and in cost of feed per kg weight gain of pigs, it shows that it is economical to include BW in the diet of growing pigs provided it is properly detoxified without any adverse haematological effects.

Conclusion

The results obtained in this study indicate that up to 100% raw bambara nut waste can be incorporated into the diets of growing pigs without any deleterious effect.

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