



EFFECT OF RAW AND TOASTED BAMBARA GROUNDNUT (*VIGNA SUBTERRANEAN (L) VERDCOURT*) ON THE PERFORMANCE OF BROILER FINISHER BIRDS

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ABSTRACT

The study was conducted with Ninety broiler finisher birds (Anak Strain) to determine the effect of raw and toasted bambara groundnut diets on the productive performance of the birds. Three test diets were formulated such that bambara groundnut constituted 30% of the entire diet. Treatment 1 (control) contained no bambara groundnut, treatment 2 contained raw bambara groundnut while treatment 3 contained toasted bambara groundnut. The birds were randomly assigned to the three dietary treatment groups in a completely randomized design (CRD) experiment. The experiment lasted for six weeks. Each treatment had thirty birds which were replicated three times with ten birds per replicate. The following parameters were measured during the experimental period, body weight, feed intake, feed conversion ratio, cost per kg weight gain, and feed dry matter digestibility and mortality. Various organs were eviscerated, weighed and evaluated for gross lesions. The result revealed that treatment 2 group performed better than treatment 1 and 3 groups. It was also observed that the cost per kg weight gain (₦) was higher for treatment 3 group than treatment 1 and 2 groups. There was no pathology observed in the various organs, but some organs from the treatment 2 group weighed more than the organs from the other two dietary treatment groups but the difference were not significant ($P > 0.05$). Mean body weights of 1637g, 1778g and 1525g were obtained from treatment 1, 2 and 3 respectively. Broiler finisher birds fed raw bambara groundnut at 30% inclusion exhibited good performance indices than others.

KEYWORDS: Bambara groundnut, raw, toasted, performance, broiler finisher.

broiler birds fed raw and toasted bambara groundnut meals.

INTRODUCTION

Low intake of animal protein is a phenomenon that is associated with developing countries which Nigeria is one of them (Amaefule, 2003). The ever-increasing cost of livestock and poultry feeds with the attendant increase in the cost of producing farm animals and their products have created a wide gap between animal protein supply and its demand (Onu et al, 2006). This has necessitated a need to explore the use of non-conventional feedstuffs that are valuable, cheaper and locally available (Dauda et al, 2009). It is imperative therefore, to look inward for alternative feed resources that are cheaper to enable animal and their products be produced at affordable prices. This will help the average Nigerian have access to livestock/poultry meat, egg and other products (Madubuike and Ogbonnaya 2003). Bambara groundnut has been identified (Fetuga et al, 1975) as an underutilized energy and plant protein feed resource for livestock and it is indigenous to Africa. Bambara nut seed contains 12.13-22.9% crude protein (Ndiokwere, 1982; Apata and Ologhobo 1994; and gross energy 19MJ/kg DM). According to Pfetter et al, (2002), the valuable quality has accorded it the wide usage it has been associated with in both the livestock and poultry industry. The study was therefore designed to assess the performance of finisher

MATERIALS AND METHODS

Source of Feed ingredient

The bambara groundnut used in this study was bought from a local market in Makurdi in Benue State. Toasting of the bambara groundnut involves pouring the needed quantity of the nut into a garri frying pan, set over fire. The nut is stirred to avoid excessive burning. The turning of the nut while on fire continued until it turned brownish. Excessive burning was avoided so as not to completely destroy the essential amino acids. The toasting lasted for about 15 minutes and it was done in batches.

Experimental Site

The experiment was conducted in Rivers State University Demonstration farm, Port Harcourt. Port Harcourt lies between Latitude 6 and 8° South and Longitude 9 and 6° West and situated in the Southern boundary of the humid zone.

Housing and Management of birds

Ninety broiler finisher birds (Anak Strain) were used for the experiment. The birds were housed in a deep litter pen in an open sided poultry house partitioned with wood and wire gauze. The birds were vaccinated according to schedule. Coccidiostat was given at intervals of 2 to 3 weeks for prevention of coccidiosis.

Experimental diet

Three experimental diets were formulated such that bambara groundnut, raw and toasted replaced groundnut meal at 30% on weight basis. The diet was formulated to incorporate maximum quantity of bambara groundnut and at the same time contain at least 20% crude protein. The percentage composition of the experimental diet is shown in Table 1.

Table 2 showed the calculated level of the diets while Table 3 showed the proximate composition of matured bambara groundnut as % dry matter.

Data Collection

Weekly records of the weight of the birds, feed intake, feed efficiency, protein and dry matter digestibility and mortality for the corresponding period were kept for each replicate group.

Statistical Analysis

Data collected on performance were subjected to analysis of variance (ANOVA) as outlined by Steel and Torrie (1980) in a completely randomized design at 5% level of significance. Means were separated using Duncan Multiple Range Test (Duncan, 1955).

Digestibility Study

At six weeks of experiment, ten birds were randomly selected from each experimental group and put in different cages for the digestibility study. The birds remained in the cages for three days before the commencement of the digestibility trial. The trial lasted for five days, polythene bags were used to collect the total faeces under the cages. The faeces were weighed wet, the aliquots taken from

each group and preserved in the polythene bags containing a few drops of formaldehyde. At the end of the trial, fifteen birds, five from each group were slaughtered and their organs were weighed, examined for gross pathological lesions.

RESULTS AND DISCUSSION

The performance of the broiler finisher birds are shown in Table 4. Data on proximate composition of experimental diet, faeces and mean weight of internal organs are shown in Table 5, 6 and 7 respectively. Mean body weight gains for the treatments were significantly different ($P < 0.05$). Birds fed diets 2 had the highest weight followed by birds fed treatment 1 (Control) while birds fed diet 3 had their weights depressed.

The impressive performance of birds fed raw bambara groundnut diet could be as a result of the appreciable amount of lysine and methionine content. The reason for the relatively poor performance of the birds fed toasted bambara groundnut diet might be that the heating process during toasting may have denatured the proteins in the test ingredient making them unavailable to the birds (Nwachukwu et al, 2005). There was significant differences ($P < 0.05$) among the treatments means for both feed intake and feed conversion ratio. Birds placed on diet 2 gave the highest ($P < 0.05$) mean feed intake and feed conversion ratio. This seems to suggest that replacing groundnut meal with raw bambara groundnut can provide a better amino acid balance for growing birds.

TABLE 1: Percentage composition of experimental diet fed to broiler finisher from the 6th to 12th week of age.

Ingredients	Treatment		
	T1	T2	T3
Maize	64.20	40.30	40.30
Groundnut Cake	26.70	20.70	20.70
Raw bambara groundnut	0.00	30.00	0.00
Toasted bambara groundnut	0.00	0.00	30.00
Fish Meal	4.00	4.00	4.00
Bone Meal	3.00	3.00	3.00
Periwinkle Shell	1.00	1.00	1.00
Methionine	0.10	0.10	0.10
Lysine	0.10	0.10	0.10
Salt	0.40	0.40	0.40
Vitamin Premix	0.40	0.40	0.40
Total	100.00	100.00	100.00
% Crude Protein	21.24	20.80	20.80
MEKcal/kg	3062.90	3163.70	3164.70
Cost/kg (₦)	100.00	100.00	100.00

Supplied per kg diet: Vit. A 800 I. U, Vit. D₃, 1600 I. U, Vit. K, 2mg, Vit. C 10mg, Vit. B₂, 3g, Calcium Pantothenate, 45mg, Vit. B, 9mg, Vit. B₆, 1mg, Vit. B₁₂, 0.008mg, Folic acid, Manganese, 70mg, Zinc, 50mg, Iron, 20mg, Copper, 3mg, Iodine, 1mg, 0.2mg, Selenium, 0.1mg, anti-oxidant, 0.1g, Chlorine, 0.2g, anti-mould 15mg and growth promoter, 20mg.

The result showed that the cost per kg weight gain (₦) of birds fed diet 3 was higher than that of the control diet and diet 2, the raw bambara groundnut diet. But there was no much difference between the cost per kg weight gain (₦) of the result obtained from the digestibility coefficient of 83.45%. The control diet also had a higher apparent digestibility coefficient than diet 2. The high digestibility

of diet 3 implies that it was better utilized by birds than diets 1 and 2.

This utilization pattern agrees with the findings of (Pfetter et al, 2002). The result of protein digestibility shows that treatment 1 (control) had the highest coefficient of 91.59%, followed by treatment 2 (89.73%) and 3 (87.86%) respectively.

The result revealed the better performance of treatment 1 and 2 groups of birds over treatment 3 group. The merit of raw bambara groundnut over the toasted may be attributed to the heat applied which probably may have denatured the available proteins during toasting making them insoluble and less digestible. The result of the mean weight of the internal organs revealed that gizzard, spleen, pancreas, liver, lungs, kidney and proventriculus from treatment 2 weighed more than the ones from treatments 1 and 3, but differences were not statistically significant ($P>0.05$). The increase in the weight of the pancreas in the raw bambara groundnut treatment group is in agreement with (McDonald et al, 1998). The hearts from the three groups weighed almost the same (0.46, 0.47 and 0.47) respectively, while the gall bladder in treatment 1 (control)

group weighed more than treatment 2 and 3 groups but the differences were not statistically significant ($P>0.05$). Among the treatment groups, no bird had observable abdominal fat. There were no gross pathological lesions observed in the various organs.

CONCLUSION

The result of this study showed that raw bambara groundnut can be incorporated in diets of broiler finisher birds at 30% inclusion level, without any deleterious effect on the performance of the birds. The study also showed that raw bambara groundnut can be used to supplement groundnut meal in broiler finisher diets as in other birds and rabbit diets.

TABLE 2: Calculated Nutrient level of the diet

Nutrients	T ₁	T ₂	T ₃
Crude Protein (%)	21.24	20.80	20.80
MEKCal/kg	3062.90	3163.70	3164.70
Crude Fibre (%)	2.536	4.170	4.170
Lysine (%)	1.374	1.332	1.332
Methionine (%)	0.365	0.375	0.375
Calcium (%)	1.537	1.537	1.537
Total Phosphorus (%)	0.435	0.412	0.412

TABLE 3: Proximate composition of matured bambara groundnut (%DM)

Nutrients (%DM)	
Crude Protein	21.60
Ether Extract	3.75
Crude Fibre	7.60
Ash	4.55
Nitrogen-free Extract	62.25
Moisture	8.80
Dry matter	91.20

TABLE 4: Performance of broiler finisher on the Experimental diet (6-12 weeks)

Parameter	T ₁	T ₂	T ₃	SEM
Mean initial body weight (g)	531.23	545.73	527.25	11.26
Mean final body weight (g)	1637.00 ^a	1778.00 ^b	1525.00 ^c	83.76
Mean total body weight gain (g)	1105.77 ^b	1232.27 ^a	997.75 ^c	74.97
Mean total feed intake (g)	4637.00 ^c	4789.00 ^a	4770.00 ^a	0.86
Feed conversion ratio (FCR)	4.19 ^b	4.80 ^a	3.87 ^c	0.27
Cost per kg weight gain (₦)	165.15 ^b	165.80 ^b	189.75 ^a	2.46
Apparent feed dry matter digestibility (%)	79.35 ^b	75.62 ^c	83.54 ^a	2.07
Mortality (%)	91.59 ^a	89.73 ^a	87.86 ^b	2.82
	4.00^a	0.00^c	2.00^b	0.13

Means in a row with different superscripts are significantly ($P<0.05$) different

SEM = Standard Error of Mean

TABLE 5: Proximate composition of Experimental diet (%DM)

Nutrients	T ₁	T ₂	T ₃
Crude Protein	21.65	20.95	21.65
Ether Extract	1.86	1.89	1.98
Dry Matter	88.89	82.78	89.87
Moisture	11.11	17.22	10.13

TABLE 6: Proximate composition of the faeces (%DM)

Nutrients	T ₁	T ₂	T ₃
Crude Protein	2.26	3.78	3.46
Ether Extract	1.30	1.78	2.26
Dry Matter	26.23	19.16	21.31
Moisture	73.77	80.84	78.69

TABLE 7: Mean weight of internal organs (% of body weight)

Organs	T ₁		T ₂		T ₃	
	(%) wt	SEM	(%) wt	SEM	(%) wt	SEM
Gizzard	1.97 ^a	0.06	2.11 ^a	0.21	1.99 ^a	0.07
Spleen	0.12 ^a	0.02	0.21 ^a	0.02	0.19 ^a	0.03
Pancreas	0.16 ^{ab}	0.02	0.24 ^a	0.06	0.18 ^{ab}	0.01
Liver	0.41 ^{ab}	0.04	1.76 ^a	0.14	1.34 ^b	0.10
Intestine	2.56 ^b	0.24	3.62 ^a	0.06	3.14 ^{ab}	0.08
Lungs	0.34 ^{ab}	0.01	0.42 ^a	0.02	0.40 ^b	0.01
Heart	0.46 ^a	0.05	0.47 ^a	0.03	0.47 ^a	0.03
Gall bladder	0.17 ^a	0.01	0.15 ^b	0.01	0.16 ^{ab}	0.03
Kidney	0.64 ^a	0.04	0.83 ^a	0.05	0.44 ^a	0.01
Proventriculus	0.26 ^a	0.03	0.36 ^a	0.01	0.29 ^a	0.05

ab means a row with different superscripts are significantly different ($P < 0.05$).

WT = Weight

REFERENCE

- Amaefule, K.U. (2003) Nutritional evaluation of some agro-industrial by-products using pigs in humid tropics. Ph.D. Thesis, Michael Okpara University of Agriculture Umudike.
- Ani, A.O. (2006) Effect of toasted Bambara groundnut (*Voandzeia Subterranean L*) waste on haematology, Carcass and organ characteristics of growing rabbits. Pro.31st Ann. Conf. Nig. Soc. for Anim. Prod. (NSAP), pp. 341-345.
- Apata, D.F. and Ologhobo, A.D. (1994) Biochemical evaluation, of some Nigerian legume seeds. Food chemistry, 49: 33-38.
- Dauda, O.M., Omuniyi, M. and Gotham, G.E. (2009) Use of non-conventional feeds. Potentials and constraints for rabbit production in Nigeria Proc. 34th Ann. Conf. of the Nig. Soc. For Animal Prod, pp: 198-201.
- Duncan, D.B. (1955) Multiple ranges and Multiple F-tests. Biometrics 11: 1-42.
- Fatuga, B.I, Oluyemi, J., Adekoya, A.A and Oyenuga, V.A. (1975) Nigerian Agriculture Vol. 12.
- Madubuike, F.N and Ogbonnaya, O. (2003) The potential use of white star apple seeds (*Chrysophyllum albidum*) and physic nut (*Jatropha curcas*) as food ingredient for rats. Journal of Agriculture and food science 1(2): 97-105.
- McDonald, P. Edwards, R.A., Greenhalgh, I.P.D and Morgan, E. (1998) Animal Nutrition, 5th ed. pp 232-235.
- Ndiokwere, C.I. (1982) Determination of crude Protein and some mineral content of edible Nigerian legumes using activation analytical technique. Legume Research 5(2): 87-90.
- Nwachukwu, N.C., Wokem, G.N., Azoro, C., Adeleye, O.O. and Ezenlec, A. (2005) Effect of roasting methods on the nutritive value of pigeon pea (*Cajanus cajan*) and chemical evaluation of its protein quality. Yankari journal 2:28-32.
- Onu, P.N. Nwapku, P.E. and Chukwu, L.O. (2006) Performance of broiler chicks (*Gallus domesticus*) fed maize offal-based diets supplemented with Roxazyme G. Enzyme.
- Pfetter, E., Niess, E. and Nji, F.F. (2002) Performance of growing broiler chicks fed bambara groundnut (*Vigna Subterranean*). Investigation of Animal Nutrition 4: 56-61.
- Steel, R.G.D. and Torrie, J.H. (1980) Principle Procedures Statistics. A biometrical approach 3rd ed. McGraw-Hill Book co. Inc. New York.