
NUTRITIONAL EVALUATION OF TOASTED BAMBARANUT MEAL (*Vigna subterranean* (L) Verde) ON GROWTH PERFORMANCE AND CARCASS CHARACTERISTICS OF HARCO COCKERELS

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ABSTRACT

An experiment was conducted to assess the nutritive value of toasted bambaranut meal (TBM) on the growth performance of Harco cockerels. One hundred and fifty day old cockerels were randomly allotted to five dietary treatments in which toasted bambaranut included at 0%, 15%, 30%, 45%, and 60% levels respectively designated as diet 1, 2, 3, 4, and 5 respectively. The experiment lasted for eight weeks. Results showed that there were significant difference in daily feed intake (44.67-47.92g), daily weight gain (11.23-13.36g) and feed conversion ratio (3.34-4.23) ($P < 0.05$). The toasted bambaranut affected the live weight (730.65-850.28g), pluck weight (64.72-67.25%) and dressed weight (53.21-56.17%) ($P < 0.05$). The organs weight were statistically similar ($P > 0.05$). Toasted bambaranut can be included at the diet of Harco cockerels at up to 30% without deleterious effects on performance with concomitant reduction in cost of production

Keywords: Cockerels, Toasted bambaranut, performance

INTRODUCTION

The deficiency of animal protein in the diet of an average Nigerian has been reported (Adegbola, 1998). The low protein intake has been attributed to low level of animal protein production and high cost of animal products (Kperegbeyi and Onwumere, 2007). The production of highly reproductive animals with short generation intervals such as poultry is a logical solution to the problem (Maidala and Istifanus, 2012). There is need, therefore to explore the use of alternative vegetable protein sources that are locally available, cheap and rarely consumed by man. One of such alternative feed ingredients is bambaranut which is comparatively cheaper compared to soyabean. Bambaranut (*Vigna subterranean* L Verde) is an indigenous African legume, which is grown for its edible grain (Rachie and Roberts, 1974). Oleyede *et al.* (2010) reported that the seed of bambaranut contain 34 % CP,

2.80 % EE, 5-25 CF 6.47 % ash and 50.58 % nitrogen-free extract. Bambaranut is probably the most drought-resistant of the grain legumes and may be found growing successfully where annual rainfall is below 500 mm and optimum between 900-1000 mm per year (Ocran *et al.*, 1998). The plant can be grown under dry climatic conditions where the rainfall during the rainy season would be adequate to enable them to accomplish their vegetative cycle (Borget, 1992). An evenly distributed rainfall in the range of 600-1000 mm encourages optimum growth but satisfactory yields can be obtained in areas with a pronounced dry season since the crop is relatively drought resistant (Messiaen, 1992). Bambaranut is resistant to high temperatures and can be grown on poor marginal soils not suitable for other leguminous crops (Yamaguchi, 1993). Bambaranut is not attacked by disease and pests in any of its production regions. However, in damp conditions, it may be

susceptible to various fungal diseases (Baudoin and Mergeai, 2001). It has a very low insect pest and disease susceptibility (Tweneboah, 2000). The crop ranks third among the grain legume crops of Africa after groundnut and cowpea (Linnemann, 1992). Bambaranut is a crop that is grown mainly at subsistence level and its annual production level is estimated around 330,000 metric tons, of which Nigeria is the largest producer. The worldwide demand of the crop is much higher than its production. Bambaranut is widely grown and distributed in a number of states in Nigeria. Studies in livestock production have shown that bambaranut can be used in the feeding of poultry and rabbits (Oleyede *et al.*, 2010). The use of bambaranut and its products are limited due to the presence of anti-nutritional factors such as cyanogens, flatulence factors, tannins, trypsin inhibitor and haemoglutinins in the raw state (Doku and Karikari, 1981; Ensminger *et al.*, 1990).

The inclusion bambaranut (*Vigna subterranean*) meal in the diets of growing cockerels will help to enhance production by reducing the cost of production. The antinutritional factors in the raw beans such as protease inhibitors, haemagglutinins, tannins, cynogenic glycosides and flatulence factors limit their nutrient potentials as feed ingredients in monogastric diets (Ensminger *et al.*, 1996; Enwere, 1998). However, toasting of the seeds can detoxify the antinutritional factors (Akanke and Fabiyi, 2010; Maidala *et al.*, 2011). Cockerels are good sources of meat in Nigeria and command high demand because they possess special flavor and toughness. However, the major problems with cockerels are their slow rate of growth, high feed intake, poor feed conversion efficiency and consequently high cost of production (Ojewola and Ozuo, 2006). Cockerels forms an integral part of the poultry meat supply of Nigerians and are of higher demand than broilers and spent layers (Abeke *et al.*, 2008). This is because in most developed countries of the world, cockerels are destroyed immediately at the hatchery after being

hatched. This is because cockerels grow very slowly reaching appreciable market weight of about 2 kg at about eight months of age even under condition of adequate care and good feeding. Also at this age their meat would have become too tough for consumption which is preferred by most consumers in the country. The research reported herein is on graded levels of toasted bambaranut on growth performance and carcass characteristics of cockerels.

MATERIALS AND METHODS

Experimental site

Katagum local government is situated on the northern part of Bauchi state, Nigeria. It is located between latitudes $11^{\circ} 42'$ and $11^{\circ} 40'$ and longitude $10^{\circ} 31'$ and $10^{\circ} 11'$ east (Anon, 2009). It shares common boundary with Itas/Gadau local government in north west, Jama'are to the west, Dambam to the east, Misau to the south west, Giade to the south and Shira to the southwest (Azare, 2013). It has a landmass of 1,120 square kilometers (NPC, 2009). The climate of the study area is controlled by inter tropical convergent zone (ITCZ) which is marked by the rainy and dry season. The major climate elements that influence the climate of the study area and affecting the farming system are temperature and precipitation (rainfall), the annual temperature ranged between $22-33^{\circ} \text{C}$ from April to May (Bashir *et al.*, 2001). The mean annual rainfall ranged between 615.6-985mm with peak between July- Augusts. The study area is in the Sudan savanna, the vegetation is greatly determined by the nature of the soil. The soil in the study area is aerosol with sandy and loamy sand texture and a high percolation rate

Sources and processing of feed ingredients

Feed ingredients were procured at Azare main market and raw bambaranut seeds were sand roasted to detoxify the anti-nutritional factors. One hundred and

fifty day old cockerels of Harco breed were randomly allotted to five dietary treatments. There are fifty chicks per treatment replicated five times in a completely randomized design (CRD). The roasted bambaranut was used to formulate five diets in which toasted bambaranut was included at 0%, 15%, 30%, 45%, and 60%. The diets were isonitrogenous; the percentage composition of experimental diets was shown in Table 1. The experiment lasted for eight weeks. Daily feed intake was measured daily by subtracting the difference between feed giving and remainder, birds were measured weekly to determine the weekly weight changes. At the end of the experiment, 10 cockerels (2 from each treatment) were randomly selected, starved overnight, weighed and slaughtered in the morning by slitting the throat. They were defeathered, eviscerated then the organs and guts parts were separated; liver, lungs, small intestine, large intestine were weighed individually. Data generated for all the parameters were subjected to analysis of variance technique (ANOVA balanced design) as described by Steel and Torrie (1980). Where there was significant difference between treatment means, Duncan multiple range test (DMRT) was used to separate the means Duncan's (1955).

RESULTS AND DISCUSSION

Table 1 showed the nutrient composition of the experimental diets, the crude protein content of the diet is similar to those reported by Ojebiyi *et al.*, 2012 for cockerels in the tropics. The performance characteristics of cockerels fed various levels of toasted bambaranut are shown in Table 2 while the carcass characteristics are shown in Table 3. The daily feed intake at 30% level of toasted bambaranut was significantly ($P < 0.05$) better than 45% and 60% level of inclusion and which is statistically similar with 0% and 15% level of inclusion ($P > 0.05$). Birds consumed more feed to balance their nutrient requirements especially energy and protein, this suggest higher feed intake in the 45% and 60% diets. The daily weight gain decreases as

you increase the levels of toasted bambaranut. The daily feed intake reported in this study is within the range of values (45.26-63.47g) reported by Offiong *et al.* (2011) on cockerels fed horse eye bean (a legume similar to bambaranut). The daily weight gain was affected by the various levels of roasted bambaranut, with better weight on 30% level of inclusion (13.15), this can be attributed to efficient utilization of the diet and further increases above 30% decreases the weight gain (Table 2). The feed conversion ratio decreases as you increase the levels of toasted bambaranut and the values reported in this study is better than (4.72-8.94) reported by Isikwenu, 2011 on cockerels fed brewer dried grains with enzymes. The feed cost decreased as you increase the levels of toasted bambaranut and it was lowest at 60% level of inclusion (N 62.12). The cost of feed (N/kg) gain was lower in 30% level of inclusion (N 259.13) and highest in 45% level of inclusion (N 269.90). The live weight was significantly ($P < 0.05$) affected by various levels of bambaranut. The results of the final weight gain observed in this study are higher than (664.00-707.00g) reported by Ani *et al.*, 2013 who fed brewers dried grain with enzymes in the diets of cockerels and observed that the final weight decreased significantly ($p < 0.05$) as the level of the bambaranut increased in the diet. The dressed weight followed the same trend of decreasing as you increase the levels of toasted bambaranut. The organs weight were not affected by the various levels of levels of toasted bambaranut and values reported in this study compares favorably by earlier work of Abeke *et al.*, 2008 on cockerels fed lablab seeds (a legume similar to bambaranut).

CONCLUSION

It is evident from the results obtained in the present study that up to 30% toasted bambara nut can be included in the diet of growing cockerels without any deleterious effect on their performance with concomitant reduction in cost of production

Table 1: Gross composition of the experimental diets fed to cockerels

Ingredients	Levels of toasted bambaranut				
	Control	15%	30%	45%	60%
	1	2	3	4	5
Maize	51.99	43.15	44.62	45.96	47.19
Full fat soyabean	22.11	26.31	20.63	15.48	10.76
Roasted bambaranut meal	00.00	4.64	8.84	12.66	16.15
Wheat offal	20.00	20.00	20.00	20.00	20.00
Fish meal	2.00	2.00	2.00	2.00	2.00
Bone meal	3.00	3.00	3.00	3.00	3.00
Common salt	2.00	2.00	2.00	2.00	2.00
Lysine	0.20	0.20	0.20	0.20	0.20
Methionine	0.20	0.20	0.20	0.20	0.20
Vitamin/mineral premix *	0.25	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00	100.00
Calculated analysis					
Crude protein (%)	18.61	18.52	18.41	18.38	18.31
Metabolizable energy (kcal/kg)	2880	2868	2860	2852	2845
Each kilogram contains; vit. A, 10,000,000 IU, vit. D ₃ 2,000,000 IU, Vit. E 23,000mg, Vit. K ₃ 2,000mg, Vit. B ₁ 1,800mg, Panthothenic Acid 7,500mg, Vit. B ₆ 3,000mg, Vit. B ₁₂ 15mg, Folic acid 750mg, Biotin 11260mg, Choline Chloride 300,000mg, Cobalt 200mg, Copper 3,000mg, Iodine 1,000mg, iron 20,000mg, Manganese 40,000mg, Selenium 200mg, Zinc 30,000mg, Antioxidant 1,250mg					

Table 2: Performance of cockerel's chicks fed graded levels of roasted bambaranut

Parameters	Levels of toasted bambaranut					SEM
	Control	15%	30%	45%	60%	
	1	2	3	4	5	
Initial weight (g)	102.11	100.28	101.67	102.09	101.75	NS
Final weight (g)	850.28 ^a	840.32 ^a	838.19 ^a	770.92 ^b	730.65 ^a	*3.10
Daily feed intake (g)	44.67 ^b	46.28 ^a	47.21 ^a	47.92 ^a	47.51 ^a	*2.00
Daily weight gain (g)	13.36 ^a	13.21 ^a	13.15 ^a	11.94 ^b	11.23 ^b	*1.30
Feed conversion ratio	3.34	3.50	3.59	4.01	4.23	*1.30
Mortality	0	0	1	0	1	NSA
Feed cost (₹)	78.00	74.67	72.18	67.25	62.12	NSA
Feed cost (₹/kg) gain	260.79	261.60	259.13	269.90	262.90	NSA

Means bearing different superscripts in the same row are statistically different ($P < 0.05$). NSA = Not statistically analyzed

Table 3: Carcass characteristics and organs weight of cockerels fed toasted bambaranut

Parameters	Levels of toasted bambaranut					SEM	
	Control	15%	30%	45%	60%		
	1	2	3	4	5		
Final weight (g)	850.28	840.32	838.19	770.92	730.65		*
Slaughter weight (%)	77.65	76.22	76.10	75.97	74.00		*
Pluck weight (%)	67.25	66.12	65.85	65.62	64.72		*
Dressed weight (%)	56.17	55.27	54.62	54.27	53.21		*
Head and legs (%)	5.55	5.47	5.40	5.38	4.18		NS
Gizzard (%)	5.25	5.98	6.51	6.78	6.95		NS
Liver (%)	2.55	2.40	2.40	2.38	2.35		NS
Heart (%)	0.40	0.38	0.37	0.36	0.35		NS
Small intestine (%)	1.67	1.60	1.61	1.58	1.50		NS
Large intestine (%)	3.21	3.17	3.15	3.10	3.00		NS

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