GROWTH RESPONSE OF FINISHER BROILERS FED VARYING DIETARY LEVELS OF BAMBARA NUT *(VIGNA SUBTERRANEA (L) VERDE)* OFFAL AS PARTIAL REPLACEMENT FOR MAIZE

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ABSTRACT
Looking ahead towards the path to inclusive prosperity by enhancing the productivity of bambara nut production in Nigeria will be a step in the right direction towards fighting food insecurity and malnutrition in the country. Thus, this study was carried to assess growth response of finisher broilers fed varying dietary levels of bambara nut (Vigna subterranea (l) verde) offal as partial replacement for maize. A 28 day feeding trial was conducted for the evaluation. Four diets containing 0, 5, 10 and 15% levels of Bambara Nut Offal (BNO) coded T1, T2, T3 and T4 respectively were fed to 120 Ross 308 strain broiler birds. The broiler birds were divided into four groups of 30 birds per treatment replicated three times with 10 birds per replicate. The treatment diets were randomly assigned to experimental stocks in a completely randomized design (CRD). Performance data revealed that treatment significantly (P<0.05) affected the final body weight, body weight change and daily weight gain of finisher broiler birds. The highest final body weight of (2733.33g) was recorded in T2 (5% inclusion) while the least body weight of (2266.67g) was recorded by birds in T4 (15% inclusion). In view of the above result, BNO should be included in the ration of finisher broilers at 5% level for optimum performance to make animal protein available at a reduced cost and maximized profit.
Keywords: **Growth response, Finisher broilers, Bambara nut offal, Replacement value, Agro-industrial by-products.**

INTRODUCTION
Food and agriculture stand today at a crossroads, with an increasing population putting pressure on limited resources. As a mainstay of many worlds' economy, sustainable agriculture is the key for intensified economic, social, industrial and living standards of many countries. The development of the livestock industry in Nigeria is fundamental to support economic transformation, social and health perspective especially at this period ie (2024) when the global poultry sector shows signs of recovering market growth. The Nigerian government can take advantage of the projected global poultry market growth of (1.5-2.0) % in 2024 (Poultry World, 2024) and reposition the sector for export promotion and value addition

A closer look at the Nigerian livestock industry speaks volume of the detrimental rise of commercial feeds, fuels and labour costs (Animal & Pet feed Production in Nigeria, 2024). The poultry industry is badly hit by the upsurge in feed prices, and this has negatively affected the market prices of the poultry products like egg, chicken, and other byproducts of economic significance.

The sustainability outlook in the poultry sector will focus on devising feeding strategies that will be less dependent on the importation of feed raw materials with full concentration on agro industrial byproducts transformations and value additions.

Looking ahead towards the path to inclusive prosperity by enhancing the productivity of Bambaranut production in Nigeria will be a step in the right direction towards fighting food insecurity and malnutrition in the country.

Bambara groundnut is a climate resilient and nutritious leguminous crop, that has gained prominence as a potential solution to food security challenges in various regions of the world (Mayes et al., 2019). It plays a vital role in diversifying diets and improving nutrition because of its high protein content, essential vitamins, and minerals constituents (Ogundele *et al*., 2020).

Bambara nut offal is the waste from the milling of Bambara groundnut seed. The insight into the use of the offal as an alternative energy and protein source could contribute to solving the problem of high cost of poultry feed and could provide a better avenue for solving its environmental nuisance (Tuleun *et al*., 2020). It contains 18.30% crude protein, 20% crude fibre, 5.36% ether extract, 41.64% nitrogen free extract, 10.2% moisture, and 16.74%MJ/kg gross energy (Ani *et al*., 2012). Despite much work done in Bambara nut offal, there is still dearth of information on the appropriate inclusion levels for optimum growth and productivity of broiler birds hence, the relevance of this study.

MATERIALS AND METHODS

Location of the study

The study was carried out at the Poultry Unit of the Livestock section, Teaching and Research farm of the Department of agriculture, Alex Ekwueme Federal University Ndufu-Alike Ikwo, Abakaliki, Ebonyi State which lies between latitude 06^05'N and longitude 08^05'E of the Greenwich meridian and Altitude of 55m above sea level. The annual rainfall is between 1000-1500mm. The vegetation of the area is predominantly derived savannah, and the mean annual temperature is about 24^0C while relative humidity is between 60-80% (Ogbodo, 2013).

Experimental animals and design

A total of 120, 4-week-old ROX-306 strain broilers used for the study were obtained from a hatchery farm at Ogun State certified to be physically healthy. They were acclimatized for five days and fed on controlled diet. The birds were raised in a deep litter system whose floor was covered with wood shavings and feed was provided throughout the experimental period. Standard management practices were strictly observed. Thereafter, birds were randomly allocated to four dietary treatments and were replicated three times with each replicate having 10 birds in a completely randomized design (CRD). Feed and clean drinking water were supplied *ad-libitum* while other routine management practices were observed.

Experimental Diets and Feed Formulation

Four iso-caloric and iso-nitrogenous diets were formulated such that Bambara nut offal replaced maize at 0, 5, 10 and 15% dietary levels coded T_1, T_2, T_3 and T_4, respectively. The control diet T_1 (0%) contain no Bambara nut offal to examine the performance of the finisher broilers with respect to the diets. The test ingredient (Bambara nut offal) was subjected to proximate analysis (AOAC, 2016). The broiler birds were weighed at the beginning of the experiment and body weight changes taken thereafter on weekly basis for 28 days. Daily feed intake was determined by obtaining the difference between the quantity of feed given and the quantity leftover. Feed conversion ratio and feed cost/kg live weight were computed accordingly.

Table 1: Ingredient composition of experimental diets fed to broiler birds

	Dietary	treatments		
Ingredients	**T_1**	**T_2**	**T_3**	**T_4**
Pure maize	55.00	52.25	49.50	46.75
Bambara nut offal	0.00	2.75	5.50	8.25
Soyabean meal	13.00	13.00	13.00	13.00
Groundnut cake	15.00	15.00	15.00	15.00
Wheat offal	10.50	10.50	10.50	10.50
Bone meal	2.25	2,25	2.25	2.25
Limestone	1.00	1.00	1.00	1.00
Fish meal	2.25	2.25	2.25	2.25
Common salt	0.25	0.25	0.25	0.25
Lysine	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25
Total	**100**	**100**	**100**	**100**
Calculated Analysis				
Energy (Kcal/Kg)	2835	2816	2800	2780
Crude protein (CP)	20.44	20.39	20.35	20.10

Table 2: Proximate composition of Bambara nut offal

Fractions	Percentage
Moisture Content	11.56
Crude Protein	7.22
Ether Extract	1.81
Ash	2.59
Crude Fibre	12.82
Carbohydrate (NFE)	64.00
Energy Value (Kcal/Kg)	2654

ME= Metabolizable energy calculated; ME (Kcal/kg) =37 × %CP+81 × %E.E+35 × %NFE (Pauzenga, 1985).

Statistical Analysis

Collected data were studied by statistical analysis and interpretation was done using ANOVA technique (Snedecor and Cochran, 1980) with completely randomized design employing SPSS 16.0 version (SPSS, 2015), while mean value variance showing significant ($P<0.05$) difference were separated using Duncan's Multiple Range Test (DMRT).

RESULTS AND DISCUSSION

The effects of BNO inclusion in broiler feed on performance of birds are shown in Table 3. The results showed that there were significant ($P<0.05$) differences among the treatment means in final body weight, body weight change and average daily weight gain of the birds, however, there were no significant ($P>0.05$) differences in daily feed intake, feed conversion ratio and feed efficiency among the treatments (Table 3).

Table 3: Performance characteristics of finisher broilers fed varying dietary levels of Bambara Nut Offal

Parameters	T1 (0%)	T2 (5%)	T3 (10%)	T4 (15%)	SEM
Initial body weight(g)	910^{a}	891.67^{a}	903^{a}	895.33^{a}	4.09
Final body weight(g)	2696.66^{a}	2733.33^{b}	2616.67^{c}	2266.67^{d}	106.70
Body weight change(g)	1786.67^{b}	1841.66^{b}	1713.67^{c}	1371.34^{d}	105.63
Av. Daily Weight gain (g)	63.80^{c}	65.77^{d}	61.2^{d}	48.98^{c}	3.77
Daily Feed intake(g)	138.10^{b}	140.31^{b}	143.05^{b}	120.65^{b}	5.06
Feed conversion ratio	2.16^{c}	2.13^{c}	2.34^{c}	2.46^{c}	0.08
Cost of feed/kg (₦)	214.75	212.28	209.80	207.27	3.22
Feed efficiency	0.46^{d}	0.47^{d}	0.41^{d}	0.43^{d}	0.01

a,b,c = Means on the same row with different superscripts are significantly ($P<0.05$) different. SEM= Standard Error of means.

A higher final body weight of (2733.33g) was recorded in T_2 (5% inclusion) while the least body weight of (2266.67g) was recorded by birds in T_4 (15% inclusion). T_1 (control) and T_3 (10% inclusion) has (2696.66g and 2616.67g) respectively. These findings align with the report of Udeh *et al* (2018) who recorded similar growth pattern when comparing the effect of Bambara nut offal and soybean hull at different level of inclusions in broiler finisher diets. Nevertheless, the final body weight change values of (2266.67 to 2733.33) g obtained in this study is higher than the value range of (1800 to 2350) g reported by Udeh *et al.* (2018); Ironkwe and Ukanwoko (2012) and also greater than the value (1200.54 to 1490.77) g reported by Ani *et al.,* (2012) who fed broiler chickens with raw Bambara nut waste. Increased growth rate is synonymous with high feed conversion ratio (FCR). T_2 recorded higherFCR of 2.13 followed by T_1 (2.16), T_3 (2.34) and T_4 (2.46) in that order. However, there was no significant ($P<0.05$) difference between the treatment means in relation to FCR statistically. According to Leeson and Summers (2006) the feed conversion ratio of 2 to 4 is ideal in broiler chicken performance. Feed conversion ratio in this study was higher than values reported by Tuleun *et al.* (2020). Birds on BNO based diets had better feed utilization than those on control.

The daily feed intake of T_3 (143.05g) was highest followed by T2 (140.31g). T_4 recorded the least daily feed intake (120.65g) which of course may be attributed to high level of fibre due to increasing level of BNO in the treatment diet (Lindberg, 2014). T_4 (15%) recorded the least daily feed intake of 120.65g which may be attributed to poor digestibility and utilization which is justified by lower feed efficiency of (0.41%). Average daily weight gain was significantly ($P<0.05$) influenced by T_4 having the least average daily weight gain of 48.98g and T_2 (5%) having highest average daily weight gain of 65.77g attributed to high feed efficiency due to adequate digestibility and utilization of the T_2 diet by the birds.

T_1 promoted the highest feed cost of N214.75 per kg which is statistically different ($P<0.05$) from Bambara nut offal-based diets. Feed cost of the diets reduced significantly as dietary levels of BNO increased progressively. T_4 numerically recorded the least cost, though economically may not be the best for poultry farmers. The implication of this is that the poultry farmer will save more money hence increasing profitability of the enterprise by including BNO at ideal level (Adeoti and Olawumi, 2013).

CONCLUSION AND RECOMMENDATION

This study has revealed that inclusion of Bambara Nut Offal at optimal level promoted growth and performance of broiler birds. The results shows that T_2 (5% inclusion) performed better than other levels of inclusion and hence recommended to poultry farmers for optimum performance to make animal protein available at a reduced cost and maximize profit.

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