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ANSInet
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan
Mob: +92 300 3008585, Fax: +92 41 8815544
E-mail: editorijps@gmail.com

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# Performance and Cost Evaluation of Substituting Bambara Seed [*Vigna subterranean (L) Verdc*] Offal for Soyabean Meal in the Diets of Broiler Starter Chicks

T.K.O. Obih and B.U. Ekenyem
Department of Animal Science and Fisheries, Imo State University, P.M.B. 2000, Owerri, Nigeria

**Abstract:** A 28 day feeding trial was conducted using 160 *marshal* strain of day old broiler chicks fed 0, 5, 10 and 15% levels of Bambara Seed Offal (BSO) in a completely randomized design where BSO replaced soyabean meal weight for weight. Each of the four dietary treatments was further replicated four times. Routine vaccination and medication typical of broilers were strictly adhered to. The initial weight, final weight, weight gain, feed intake, feed conversion ratio, feed cost/kilogram and feed cost/kilogram weight gain were measured. Results show that birds on control (0% BSO) and T2 (5% BSO) with weight gains 584.78 and 583.48 respectively did not differ significantly ($p>0.05$) but were superior to those of levels 10% and 15% BSO (539.4 g and 505.0 g respectively). Both feed conversion ratio and feed cost/kg declined as the level of BSO increased from 0-15% while feed cost/kg weight gain did not maintain any particular trend. Treatment 2 (5% BSO) had the lowest cost of production feed wise. The control (0% BSO) and treatment 2 (5% BSO) were statistically similar ($p>0.05$) for final weight, weight gain, feed intake and feed conversion ratio.

**Key words:** Starter broiler chicks, bambara seed offal (BSO), soyabean meal

## INTRODUCTION

The poultry industry in Nigeria and other developing countries of the world has suffered the problem of inadequate supply of feeding stuff more than any other sector of the livestock industry. Poultry feed accounts for between 70-80% of the total cost of production (Acamovic, 2001).

Soya bean meal and groundnut cake used as plant protein in poultry feed have continued to increase in price mainly due to low level of production, increased demand and high cost of industrial processing output. To reduce the high cost of poultry feed production research has now been directed at exploring the use of cheaper and nutritionally sound unconventional feed resources which can yield similar results and at the same time cost effective.

In considering the use of any feed stuff as replacement for the orthodox one, parameters like availability, nutritive value, ease of processing, cost of procurement and the absence or ease of removal of toxic/anti nutritional factors are paramount in the mind of the formulator. One of such alternative feeding stuff is the bambara (*Vigna subterranean (L) Verdc*) seed offal. Bambara seed is a hardy, drought tolerant legume seed native to Africa. In Nigeria, it is grown mainly in the middle belt geographical zone, (Doku and Karikari, 1971). Bambara seeds have been reported to contain about 24% crude protein, 6.60% lysine and 1.30% methionine (Poulter, 1981). The offal is a sievate of the milled seed and is available all year round, cheap and presently has no industrial use. Amaefule and Iroanya (2004), reported that the offal contains 21.16% CP, 12.44 MJ/kg gross energy and 5.29% CF. Some anti-nutritional factors like trypsin inhibitor, haemagglutinin, tannic acid, phytic acid and oxalate have been reported to be present in the raw bambara seed (Onwudike and Egbuakun, 1992; Apata and Ologhobo, 1997). The processing method which includes hammer milling at temperatures of 50-70°C is expected to affect the proximate composition and nutrient quality of the offal, since most of the anti nutritional factors are heat labile. Research information on the performance of poultry fed bambara seed offal diets has been more with pullet growers (Onyimonyi and Onukwufor, 2003), finisher broilers (Ekenyem and Onyeagoro, 2006; Amaefule and Iroanya, 2004). There is dearth of information with regard to the performance of broiler starter chicks from day-old fed bambara seed offal diets.

The aim of this study was, therefore is to evaluate the performance of broiler chicks fed graded levels of bambara seed offal diets as replacement for soya bean meal.

## MATERIALS AND METHODS

**Siting of the experiment:** This research was carried out at the poultry production unit of the Imo State University Teaching and Research farm, Owerri, Nigeria situated on longitude $7^{o}.01^{1}.06^{11}$ E and $7^{o}.03^{1}.00^{11}$E and latitude $5^{o}28^{1}24^{11}$ N and $5^{o}.30^{1}.00^{11}$ N.

**Corresponding Author:** B.U. Ekenyem, Department of Animal Science and Fisheries, Imo State University, P.M.B. 2000, Owerri, Nigeria

**Preparation of experimental diets:** Bambara seeds were procured from the local market and subjected to hammer milling and thereafter sieving to separate the flour from the offal. The offal was subjected to proximate analysis at the Animal nutrition laboratory of the school of Agriculture and Agricultural Technology of the Federal University of Technology, Owerri, according to AOAC (1995). Other ingredients were procured from reputable local dealers (crushed where necessary) and mixed according to the formulae shown in Table 2.

**Procurement and rearing of experimental birds:** A total of 160 day old marshal strain of broiler chicks were procured from a local distributor, brooded and reared for 28 days on deep litter in a standard tropical poultry building. Sixteen pens (each to accommodate 10 birds) were carved out within the building. The 160 birds were randomly divided into 4 groups (treatments) and assigned to dietary treatments having 0, 5, 10 and 15% bambara seed offal. Each of the treatments was further replicated 4 times in a completely randomized design.
Standard and sound management practices of sanitation, appropriate medication and vaccination were adopted. Feed and water were supplied *ad libitum*.

**Experimental design, data collection and analysis:** The Experimental design was Completely Randomized Design (CRD). Each of the four treatments had 40 birds and each replicate had 10 birds. Parameters measured were initial weight, final weight, weight gain, feed intake, feed conversion ratio, feed cost/kg of feed, feed cost/kg gain and mortality. All the birds in each replicate were weighed together for the first seven days of the experiment using a top loading (10 kg) salter weighing scale and thereafter individually for the rest of the experimental period. Weighing was done weekly in the morning hours (7am to 8am) before the day's feeding. Initial body weights of birds were taken at the start of the experiment and this was used to calculate the weight gain as final weight minus the initial weight. Daily feed intake was also measured by subtracting the weight of leftover feed from the weight supplied.
Feed Conversion Ratio (FCR) was calculated as follows:

$$FCR = \frac{\text{Feed intake}}{\text{Weight gain}}$$

Feed cost per kilogram was calculated by adding prevailing prices of the different ingredients per kilogram (at the time of the experiment) multiplied by their inclusion levels and divided by one hundred. The cost per kilogram weight gain was calculated as FCR x cost/kg of feed.
All the data were subjected to one way analysis of variance (Steel and Torrie, 1980), while differences in the treatment means were separated using the Duncan's multiple range test as outlined by Onuh and Igwemma (1998).

Table 1: Proximate composition of bambara seed (*Vigna subterranean* (L) *Verdc*) Offal

| Nutrients | Proximate composition |
|---|---|
| Crude protein (%) | 20.98% |
| Nitrogen Free Extract (NPE) % | 40.85% |
| Gross energy | 2988.5 Kcal/kg |
| Ether Extract (EE) % | 4.72% |
| Ash % | 14.70% |
| Crude Fibre (CF) % | 9.40% |

Table 2: Composition of experience diets (%)

| | Diets (BSO) | | | |
|---|---|---|---|---|
| Ingredients | $T_1$ (0%) | $T_2$ (5%) | $T_3$ (10%) | $T_4$ (15%) |
| Maize | 48 | 48 | 48 | 48 |
| Soya bean meal | 15 | 10 | 5 | 0 |
| Bambara seed offal | 5 | 5 | 10 | 15 |
| Groundnut cake | 20 | 20 | 20 | 20 |
| Wheat offal | 7.3 | 7.3 | 7.3 | 7.3 |
| Fish meal | 5 | 5 | 5 | 5 |
| Bone meal | 4 | 4 | 4 | 4 |
| Common salt | 0.3 | 0.3 | 0.3 | 0.3 |
| Premix (B/S) | 0.25 | 0.25 | 0.25 | 0.25 |
| L-lysine | 0.09 | 0.09 | 0.09 | 0.09 |
| DL-methionie | 0.06 | 0.06 | 0.06 | 0.06 |
| Total | 100 | 100 | 100 | 100 |
| **Calculated nutrient composition** | | | | |
| Crude protein % | 23.99 | 22.79 | 22.52 | 20. 44 |
| ME (kcal/kg) | 2851.8 | 2860.5 | 2869.1 | 2877.8 |
| Crude Fibre (CF) % | 4.90 | 5.04 | 6.19 | 7.33 |
| Ether Extract (EE) % | 4.39 | 4.35 | 4.41 | 4.47 |

B/S = Broiler starter vitamin/mineral premix

## RESULTS

Results of the experiment (Table 3) show that all the parameters investigated differed significantly ($p<0.05$) between treatment means. Birds on control (0%) and 5% BSO were however statistically similar ($p>0.05$) in their final body weights (640.2 g and 638.8 g), total weight gain (584.7 g and 583.4 g), average daily weight gain (20.9 g and 20.9 g), average daily feed intake (41.5 g and 41.8 g) and feed conversion ratio (1.99 and 2.00) respectively.

## DISCUSSION

The initial live weights of the birds in the various treatments were similar ($p>0.05$). Significant differences ($p<0.05$) were however observed in their final live weights of 640.2, 638.8, 595.0 and 560.5 g: total weight gain of 584.7, 583.4, 539.4 and 505.0 g: average daily feed intake of 41.5, 41.8, 43.4 and 45.2 g: feed conversion ratio of 1.99, 2.00, 2.25 and 2.51 for 0, 5, 10 and 15% levels of BSO respectively though 0% and 5% levels were similar.
The parameters decreased in performance values as the level of BSO increased from 0-15%. The reducing trend in performance values could be attributed to higher fibre levels (NRC, 1994). Earlier reports by Opara (1996),

Table 3: Performance characteristics of broiler starter chicks fed varying levels of bambara seed offal as replacement for soya bean meal

| | Diets (BSO) | | | | |
|---|---|---|---|---|---|
| Parameters | $T_1$ (0%) | $T_2$ (5%) | $T_3$ (10%) | $T_4$ (15%) | SEM |
| Initial body Wt (g) | 55.5[a] | 55.4[a] | 55.6[a] | 55.5[a] | 0.00 |
| Final body weight (g) | 640.2[a] | 638.8[a] | 595.0[b] | 560.5[c] | 0.063 |
| Total weight gain (g) | 584.7[a] | 583.4[a] | 539.4[b] | 505.0[c] | 0.016 |
| Avg. daily wt gain (g) | 20.9[a] | 20.9[a] | 19.3[b] | 18.0[c] | 0.008 |
| Avg. daily feed intake (g) | 41.5[c] | 41.8[c] | 43.4[b] | 45.2[a] | 0.004 |
| Feed conversion ratio | 1.99[c] | 2.00[c] | 2.25[b] | 2.51[a] | 0.013 |
| Feed cost/kg (₦) | 77.12[a] | 71.30[b] | 65.50[c] | 59.68[d] | 0.009 |
| Feed cost/kg wt gain (₦) | 153.5[a] | 142.6[d] | 147.4[c] | 149.80[b] | 0.006 |

[abcd]Means within the same row with different superscripts are significantly different ($p<0.05$)

Ekenyem (2006) and Ekenyem and Madubuike (2006) indicated that higher levels of fibre in the diets of monogastric animals depressed weight gain. Also, the decrease in crude protein percentage as the level of BSO increased may have depressed weight gain (NRC, 1994). Birds on 10% and 15% BSO consumed more feed than those on 0% and 5%. This agrees with the finding of Isikwenu *et al.* (2000), which stated that feed intake increased with increase in fibre content. Feed cost/kg differed significantly ($p<0.05$) between treatments and decreased as the level of BSO increased because of the wide margin per kilogram between the market prices of soya bean meal (₦65.00) and BSO (₦15.00). Feed cost/kg weight gain also differed significantly ($p<0.05$) between treatment means but did not follow any particular trend since it is a product of feed conversion ratio multiplied by the feed cost/kg 5% BSO diet produced the cheapest chicken by the 28$^{th}$ day at ₦142.60.

**Conclusion:** Though the experimental birds were able to tolerate upto 15% BSO with fair results, 5% BSO level was the optimal, replacing soya bean meal with BSO reduced the cost of broiler starter production, thereby making animal protein affordable for consumers.

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