EFFECTS OF VARIOUS PROTEIN SOURCES ON PERFORMANCE AND COST-BENEFIT ANALYSIS OF BROILER FINISHER CHICKENS

BY:

S. B. ADAM AND A. A. MOHAMMED

Abstract

A total of 120 Marshal strain of broiler chickens, aged four weeks were used to investigate the efficacy of different protein sources in enhancing productive and carcass indices of finishing broiler chickens. The birds were randomly allotted to four treatment groups of 30 birds with three replications. They were fed fairly iso-caloric-iso- nitrogenous diet of varying protein sources. The e diets were based of full-fat soyabeans meal ((T|), groundnut Meal (Tz), groundnut meal with sobyabeans (T3) and soyabeans with cottonseed meal (T4). Of all the responses measured, no significant difference was observed in terms of live weight gain and feed conversion ratio. The T[(soyabean based) group and T4 (cottonseed-soyabeans based) groups recorded significantly ($p<0.05$) higher feed intake than Tz and T3. Live weight also followed similar trend with T2 being the least. Dressing percentage and abdominal fat did not differ significantly, however, other cut-up parts were in favour ofTi and T4. The study concluded that, the use of soyabeans and cottonseed cake is most rewarding for finishing broiler chickens. **(Keywords:** Protein Sources, Broiler, Cost-Benefit)

INTRODUCTION

The nutrient requirements of broilers and laying hens are defined more precisely than for other domestic animals as observed by church (1979). The work of Leeson (2000) indicated that the science of nutrition basically involves provision of a balanced nutrients that best meet the animals need for growth, maintenance and production. To achieve this, poultry feeds are formulated with wide range ingredients mainly energy, protein, fibre, vitamin and minerals sources. The major protein sources are soyabeans, groundnut cake, fish meal, meat meal and cotton seed cake among others. Whole groundnut including the shells have an average protein content of 25% while the decorticated one has 40% - 48% CP with fibre level of 6% - 10% (Smith, 1990). In another report. Smith (2001) observed that the quality of groundnut protein is close to that of soyabean meal but its major disadvantage is that it is often contaminated with aflatoxin which renders it very unsafe for poultry feeding. Also Fetuga *et al.* (1973) reported that groundnut cake protein is limited in sulphur bearing amino acids (methionine and cystine), tryptophane, marginal in threonine and utilization can also be limited by phenylalanine. Soyabean meal is an excellent source of protein. The full fat form has 18% fat, low in fibre (5%) and have 38% of
protein. It, however, contain some antinutritional factors such as trypsin inhibitor and phytilaemegutinins, phytin etc, which can be rendered harmless by proper heat treatment (Aletor, 1993; Agbede and Aletor 2004; 2005). Cotton Seed meal (CSM) has a protein content pf41% to 42% (Olomu, 1995) but of lower hysine, methionine and cystine levels (Nzekwe and Olomu, 1982). It is a good, though variable source ofthiamine, but a poor source of carotene (Obioha, 1992). CSM has successfully been used to replace between 50% to 75% of the desirable level ofGNC (Nzekwe and Olomu, 1982) and between 30% and 40% of GNC in chicks diets (Njike,

1975). While NAPRI (1984) reported no significant effect on performance when CMS forms up to 50% of broiler diet, the findings ofAtuahene *et al. (19S6)* Susbilla *et al.* (1994) were at variance.

Protein, which is a major nutrient in poultry diet is derive from fish meal, cotton seed meal, soyabean meal and groundnut cake which are extensively being demanded for due to the competition between man and poultry. Therefore, the objective of this study was to establish a suitable combination of different sources of protein for finishing broiler chickens that is cost effective and give the desired result.

MATERIALS AND METHODS

Experimental Site: The study was conducted at the Poultry Unit of Teaching and Research Farm of the Department of Animal Science, University ofMaiduguri. The city ofMaiduguri is located in the North Eastern part of Nigeria and lies on latitude 11° 15' N and longitude 30° 05' E at an altitude of 364m above sea level (Alaku, 1983). The mean relative humidity ranges between 30% and 90% with the maximum in August and a times as low as 10% in Fberuary. Annual rainfall ranges from 300mm to 700mm and falls mostly between June and September. From the months of March to June ambient temperature varies from 35°C to 38°C. Weather condition is extremely hot during this part of the year (Filler, 1986).

Experimental Stock and Management: A total of 120 unsexed Marshal strain of broiler chickens were used for the experiment. The chicks were obtained at day old from a commercial hatchery in Ogun State, through Tanya Agro-Vet Consult Limited Maiduguri. The birds were vaccinated in accordance with the recommended vaccination program for this zone. The chicks were switched over from broiler starter diet at 4 weeks to experimental finisher diet till the end of the study period. During this period all routine husbandry practices were observed.

Experimental Diet and Design: All ingredients used in the diets were obtained and processed in Maiduguri. At 4 weeks old the birds were individually weighed and randomly allotted to 4 treatment groups of 30 birds each and were replicated thrice i.e 10 birds per replicate. Birds were finished on four diets of different protein sources. The diet were, however, fairly isocaloric and isonitrogeneous and were tagged T| (control diet), T2 (GNC based Ts (GNC + SEM) and T4 (CSM + SBM) as shown in table 1. The experiment lasted for five (5) weeks i.e 4^{th} to 9^{th} week of age. Feeding and watering were ad libitum throughout the experimental period.

Measurement of Parameters: During the course of the study, parameters measured include feed intake, body weight, body weight gain, feed conversion ratio, carcass and cost benefit analyses. Feed intake was measured daily by offering a known quantity of feed in the morning and evening. The left over was then weighed the following morning. At the end of the week, mean feed intake per bird per day was determined by summing up the feed consumed and divided by the number of days in the week. All necessary measures were stringently taken to prevent feed wastage and related losses. Birds were weighed individually from each group to determine body weight and body weight gain. This was done at the end of every week. The body weight gain was obtained by calculating the difference the mean weight of the previous week and of the current week, the difference was then considered the amount gained over that particular week. The feed conversion ratio was obtained by dividing the feed intake per bird in grams by body weight gain per bird in grams for each treatment groups. This was done on weekly basis throughout the study period. All weights were taken, using the "Collage Toledo"
weighing scale to the nearest 0.1 Og.

Carcass Analysis:- At the end of the experiment three birds were randomly selected from each replicate that is 9 birds from each treatment group. The live weight of each selected bird was taken and then slaughtered. After the blood had drained the weight was taken again. This is done for each selected bird. They were then defeathered by steeping them in hot water at 80°C for

15mins. Thereafter, they were eviscerated and picesed according to parts and organs. Each cut-up part and organ was weighed using electronic sensitive balance.

RESULTS AND DISCUSSION

There was a definite trend of increase in feed intake as age of birds advances from 5^{th} week to 9^{th} week. This is inline with the report of Olomu (1995). The highest feed intake was recorded for T4 followed by the control. These two groups consumed significantly ($P<0.05$) more feed than Tz and T3. Therefore, the use of CSM along with soyabean meal was as effective as the use of SBM alone, as protein source. In other words, the use of SBM and a combination of SBM and CSM stimulate higher appetite than the use of either GNC and SBM. This result partly agreed with the report of Nzekwe and Olomu (1982). Body weights and body weight gain also followed similar trend. Similarly, T3 was significantly heavier than Tz (Table 2). This showed that T4 (CSM-based diet) sustained heavier body weight than the other treatments. The heavier body weight may not be unconnected with the higher feed intake of the group. This was in conformity with the report of Yahar *et al,* (1985) which showed that body weight is directly related to feed intake. It however, partly disagreed with NAPRI (1984) but reaffirmed the reports ofAtuahene *et al.* (1986) and Susbilla *et al.* (1994). This result revealed further that, when used along with SBM, CSM may have better metabolizability than either GNC alone or GNC in combination with SBM. The result of mean weekly live weight gain showed that there was no significant difference among treatment groups. The higher but non significant body weight recorded for Ts means that rate of gain was not significantly influenced by the protein sources used.

The over all feed conversion ratio for the different treatments did not differ significantly ($P>0.05$) among the treatment groups. However, T2 appeared to be most efficient with a mean of 1.78. The least was recorded for T3 with mean of 3.73. Therefore no significant treatment effect was observed on feed conversion ratio. This may be attributable to the fact that the quality of groundnut cake protein is close to that of SBM as observed by Smith (2001). Mortality rate of 20% was recorded for all the groups but T4 with 3.33%. Cause of the mortality was heat stress. It implies that the CSM – SBM group appeared to better resist the heat stress.

The result obtained from this study showed that treatment groups significantly (P0.05) differ in terms of carcass weight, breast, thighs, drum sticks, wings, back and necks. However there was no significant difference in terms of dressing percentage and abdominal fact (Table 3). Breast yield was significantly higher in CSM and control groups than the other groups. This means that CSM in particular favoured development of breast muscles more than either GNC or GNC - SBM combination. This may be accounted for by the poor methionine cystine profile of the GNC as reported by Fetuga (1973). Of all the visceral organs only gizzard revealed a significant difference in favour ofT4. Also Ti and T3 were significantly higher than Tz. This further reaffirm the earlier postulates that GNC being deficient in sulphur containing amino acids is less efficient than CSM or SBM.

The cost benefit analysis of the various protein sources is shown in Table 4. The TZ diet Table 4 shows the cost-benefit analysis of the various protein sources. The T^2 diet (groundnut cake based) was the cheapest, while control-diet (soyabean meal based) was the most expensive, produced at a cost of N49.30 per kilogram. Similar trend was observed for cost of broiler chicken in T4 (Cottonseed cake based) which was slightly higher (N557.91) than the cost of production of chicken using control diet (N557.68). It is a well established fact that there is no measure of standard of allotting selling prices for chicken in the markets of North-Eastern Nigeria, other than sensible live weight by way of lifting the chicken by hand. Therefore, a range of live weight was used in assigning prices to the chickens. Chickens from Tz and Ts were sold at N900.00. While Ti and T4 were sold at N1,000.00 and N1,100.00, respectively. The higher profit margin of N542.44 was recorded for the T4 group; while the least margin of N369.44 was in T3 group i.e

soyabean-groundnut cake combined. In other words, about 80%; 72% and 97% production cost will be realized as profit when Ti, Tz, T3 and T4 diet, respectively were used.

Compare to the control, the Tz and Ts diets amounted to a "loss" of N67.00 and N74.00 per bird, respectively. On the other hand, the T4 diet recorded a saving of N98.00 per bird over the control (TI) diet. This is a pointer to the fact that when cotton seed meal is properly combined with soyabean mean, a farmer can make a profit margin of 17.99% higher than using soyabean meal alone.

CONCLUSION AND RECOMMENDATIONS

At the end of this study, it was concluded that the use of soyabean and cotton seed cake diet is more rewarding for broiler chicken than feeding soyaben based diet. This study also showed better performance in finished broiler chickens in terms of feed intake, body weight, dressing percentage when fed soyabean and cotton seed cake based diet than any other combination used. The study showed that when cotton seed meal is properly combined with soyabean meal a farmer can make a profit margin of 17.5% higher than using soyabean meal alone as plant protein source. From this study it can be seen that a farmer can be encouraged to replace a certain proportion of soyabean meal with cotton seed meal. Further investigation is hereby recommended into the possible effects of soyabean combined with cotton seed based diet on visceral organs, such as liver.

ACKNOWLEDGEMENTS

The authors wish to thank all the staff of the farm and laboratory of the Animal Science Department, University of Maiduguri for their role in the field and laboratory respectively. We also thank the Animal Science Department for part-funding this research work.

REFRENCES

Agbede, S. 0. and Aletor, V. A. (2004). Chemical Characterization and Protein Quality Evaluation ofeave Protected Concentrates. *Food Science and Technology 39:253-261*

Agbede, S. 0. and Aletor, V. A. (2005) Studies of the Chemical Composition and Protein uality Evaluation of differently Processed Conalis ensiformis and Macunapuriens seed flour. *Journal of Food and Analyses 18:89 " 103*

Alaku, S. 0. (1983). Body and Carcas Losses in goats during the advance period of west African Sahelian dry season. *World Review Animal production 19:49 - 54.*

Aletor, V. A. (1993). Allelo Chemicals in Plants and Feeding stuff: Nutritional, Bio- Chemical and Physiological Aspects in Animal Production. *Veterinary and Human Toxicology 25 (I): 57 – 67* Atuahene, C. C., Dunkoh, A and Nkansah - Darko, D.P. (1986). Effects of raw Cotton Seed meal on the performance, carcass characteristics and certain blood parameters of broiler chickens. *Animal Production Research 6(2): 107 - 114.*

Church, D. C. (1979). Eivestock Feed and Feeding *0 and B hooks incl. 121 5NW Place Corvallis, Oregon, U.S.A. PP 244 – 259*

Fetuga, B.L., Babatunde, GM and Oyenuga, V.A. (1973). Protein quality of some Nigerian Foodstuffs, chemical assay of Nutrients and amino acid composition. *Journal of Science Food and Agriculture 24: 1505 - 1514.*

Leeson, S. (2000). Introduction to Poultry Nutrition. *Department of Animal and Poultry Science, University ofGuelphy Press, Ontario, Canada PP 28.* NAPRI (National Animal Production Research Institute) (1984). Highlights of Research Achievements in Animal Feeds. *Federal Ministry of Education Sience and echnology, Lagos, Nigeria PP 12-14*

Njike, M. C (1975). Cotton Seed Meal (CSM), Groundnut meal (GNM) mixture and Protein levels in practical broiler diets. *Nigeria Animal Production, 4:81 - 84.*

Nzekwe, N. M. and Olomu, J. M. (1982). Evaluation of Cottonseed as a replacement for Groundnut meal in broiler rations. *Journal of Animal Production Research 2:123-138.*

Obioha, F.C. (1992). A Guide to Poultry Production in the Tropics. Acena Publishers, Enugu, Nigeria. PP 3 - 7, 45 - 78.
Olumu, J.M. (1995). Monogastric Animal Nutrition Principles and Practice. *A. Jachen Publishers, Benin City, Nigeria. PP 151 - 152.*
Filler, T. B. (1986). The Effects of Growth Variation during Growing Period of Broiler. *Poultry Science 65:1074 - 1079.*
Smith, A. J. (1990). The Tropical Agriculturalist (Poultry). 7"' *Edition Macmillan Education LTD, London and Oxford. PP 218.*
Smith A. J. (2001). The Tropical Agriculturalist (Poultry) *2nd Edition, Macmillan Education LTD London and Oxford. PP 119.*
Susbilla, J. P., Frand, T. L., Parkinson, G and Crow, C. B. (1994). Weight of Internal Organs and Carcass yield of Early Feed restricted Broiler. *British Poultry Science, 35:677-685/*
Yahar, S. Straschnow, A, Plavnik, I and Hurwitz. S (1985). Effects of dually Cycling Versus Constant Temperature on Chicken Growth and Feed Intake. *BritishPoultry Science 37(1)-.34 -54.*