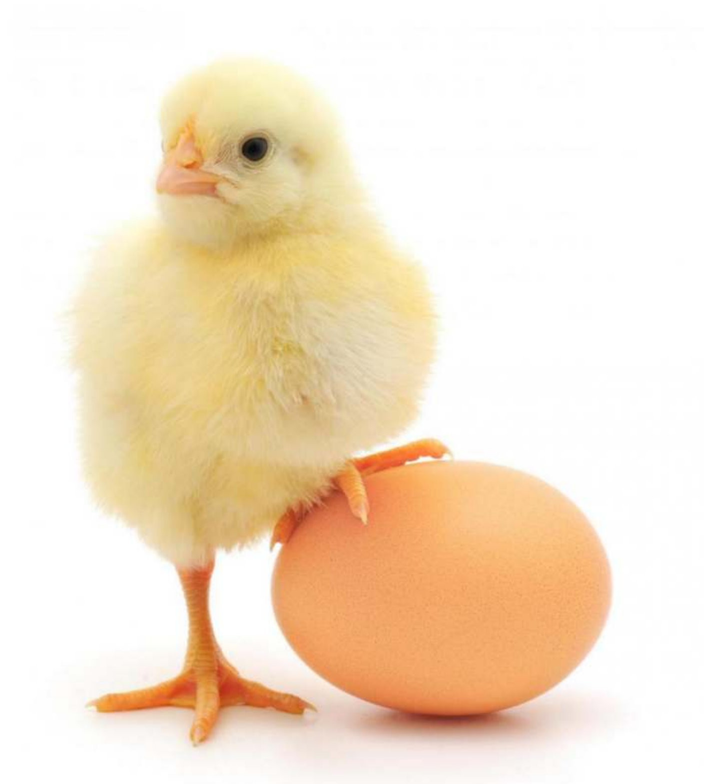
ISSN 1682-8356
ansinet.org/ijps



# INTERNATIONAL JOURNAL OF POULTRY SCIENCE

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

International Journal of Poultry Science 3 (8): 513-516, 2004


# Replacement Value of Cashew-nut Meal for Soyabean Meal in Finishing Broiler Chickens

G.S. Ojewola, F.C. Okoye and I. Agbakuru
Micheal Okpara University of Agriculture, Umudike, College of Animal Science and Animal Health,
P.M.B. 7267, Umuahia, Abia State, Nigeria
E-mail: gsojewola@yahoo.com

**Abstract:** In a 5 week feeding trial, cashewnut meal was substituted for Soyabean meal at 0, 25, 50, 75 and 100% and the diets were respectively designated as diets 1, 2, 3, 4 and 5 in a completely randomized design. Body weight changes, feed intake, feed-to-gain ratio and the economics of production were investigated. The feed-to-gain ratio was significantly ($p<0.05$) influenced while other parameters were not. Diet 3 gave the best value (2.24) followed closely by diets 4 (2.25) and 2 (2.28) respectively, while diet 1 had the poorest value (2.53) followed by diet 5 (2.40). The mean daily feed intake numerically improved as the percent cashewnut meal substitution increased from 0 to 100%. Birds fed diet 4 had the highest value (120.58g) while birds fed diet 1 had the least value (115.84g). The mean total body weight gain (g) was highest (2214g) for birds fed diet 3 while birds fed diet 1 had the least value (1878.00g). The cost/kg diet (N) decreased as the dietary inclusion of the test ingredient increased from 0 to 100%. At the end of the trial, the highest marginal revenue was obtained from birds fed diet 4 (N415.32). This was closely followed by birds fed diets 3, 5, 2 and 1. Cashewnut meal is therefore recommended as a substitute for the expensive conventional plant proteins at 25, 50 and 75% levels.

**Key words:** Cashewnut meal, soyabean meal, broiler chicks

## Introduction

Human need for quality animal protein has become both a national and an international issue that demands an urgent attention. This is because the nutritional status of the population and economic development are inextricably linked. According to Ojewola (1993), a nation's development is insured in the excellent physical and health condition of his people, because of all the resources required for national development, the human resources are the most important. The problem of protein shortage, especially that of animal origin, is a perennial one. But when a quick means of significantly increasing farm income and improving animal protein in the human diet is the objective, then poultry becomes the animal of choice (Longe, 1986).

The rising demand for poultry products has led to a tremendous increase in the number of poultry farms all over the country (Nigeria). However, the progress made so far in the poultry sector in Nigeria and many other African countries is currently being undermined by the escalating cost of feeds. According to Apata and Ojo (2000), the high cost of compound feeds for poultry is derived largely from the exorbitant prices of feed ingredients, increasing competitive demand for them by man and animals and scarcity of the conventional ingredients. Such ingredients include maize, sorghum grains, groundnut cake, soyabean meal and fish meal. Therefore, to reduce the feed cost, which accounts for 60 to 70% of total cost (Nworgu *et al.*, 1999), research efforts are being geared towards evaluating alternative feed ingredients for poultry (Igwebuike *et al.*, 2001; Ojewola *et al.*, 2003). But according to Atteh and Ologbenla (1993) such alternatives should have comparative nutritive value but cheaper than the conventional protein sources. They should also be available in large quantities. One of such alternatives is cashewnut meal (Aduku, 1993; Odunsi, 2002). Africa is the third largest global source of cashewnut and produces about 100,000 tonnes per year (Spore, 1997; Olunloyo, 1996). According to Fetuga *et al.* (1974), only about 60-65% of the total cashew production in Africa is utilized while the rest are discarded. Aduku (1993) observed that cashewnut meal has the following proximate composition viz: protein, 40.9%; fat 1.30%; crude fibre, 1.50%, Calcium, 0.06%; Phosphorous, 1.72%; Ash, 5.30%; lysine, 0.86%; Methionine, 0.35%; Cystein, 0.32% and Tryptophan, 0.29%.

The purpose of this study was to investigate the effect of substituting soyabean meal with cashewnut meal on the biologic and economics of producing broiler chickens.

## Materials and Methods

**Experimental diets and their composition:** Five diets were formulated. Diet 1 was designated as the control. Maize was the major energy source while fish meal was the major animal protein source for all the diets. Diets 2, 3, 4 and 5 had their soyabean meal replaced at 25, 50, 75 and 100% respectively while diet 1 (control) had soyabean meal as its major plant protein source. The nutrient composition of cashewnut meal (determined)

Table 1: Determined Composition of Cashewnut Meal

| Proximate Fraction | Percentage (%) |
|---|---|
| Crude protein | 38.12 |
| Crude fat (Ether extract) | 16.10 |
| Crude fibre | 0.72 |
| Ash | 5.21 |
| Dry matter (DM) | 91.43 |
| Moisture | 8.57 |
| Calcium | 0.06 |
| Phosphorous | 1.69 |
| Magnesium | 0.41 |
| Sodium | 0.05 |
| Potassium | 0.15 |

is shown in Table 1 while the composition of the treatment diets is shown in Table 2.

**Experimental animals and their management:** A total of 150 unsexed Anak 2000 broiler chicks were procured from Obasanjo Farms Limited, Ota. Ogun State, Nigeria. The day-old chicks were brooded for 3 weeks in a deep litter house. A commercial broiler starter mash (24% CP/2800kcal/kgME) was fed to the birds during the brooding period. One hundred and thirty-five (135) birds were, thereafter, weighed and randomly allotted to the five dietary treatments in triplicate lots of 9 chicks each. The birds were watered and fed the five (5) experimental diets *ad libitum* from day 22 to 63 in a completely randomized design (CRD). Other management practices such as routine vaccination, drug administration and maintenance of cleanliness in and out of the poultry house were observed.

**Parameters measured:** The mean weekly live weight and weekly feed intake were recorded, while the mean daily weight gain and feed-to-gain ratio were calculated from the data obtained.

The cost of dietary ingredients (N/kg) was noted. Feed intake per bird for the period was used to multiply the cost/kg of feed to obtain the cost of feed consumed by a bird for the period. The cost/kg weight gain was calculated according to the procedure of Sonaiya *et al.* (1986) and Ukachukwu and Anugwa (1995).

**Statistical analysis:** Data collected were statistically analyzed by analysis of variance (Steel and Torrie, 1980). The Duncan's multiple range test (Gomez and Gomez, 1985) was used to detect difference among means.

## Results

The chemical composition of cashewnut meal is shown in Table 1 while the nutrient composition of the experimental diets is shown in Table 2. Data on performance and economics of production of broiler chicken on the various dietary levels of cashewnut meal are respectively presented in Table 3 and 4. The proximate composition of the cashewnut meal is presented in Table 1. It shows that cashewnut meal contain 38.42% crude protein, 16.10% crude fat; 0.72% crude fibre and 5.21% ash while the mineral content is as follows: calcium (0.06%). Sodium (0.05%) and potassium (0.15%). Table 2 gives the nutrient composition of the experimental diets. The calculated crude protein for the treatment diets ranged from 22.31 to 23.24%. The calculated metabolizable energy ranged from 2931 to 3030kcal/kg.

Performance of Chickens on the different levels of cashewnut meal is presented in Table 3. Among the various parameters considered only the feed-to-gain ratio was significantly different ($p<0.05$) among the treatments. The feed-to-gain ratio for birds fed diets 2, 3 and 4 were significantly ($p<0.05$) improved and comparable. Birds fed diets 1 (2.53) and 5 (2.97) were the poorest. Birds fed diet 3 had a numerically higher mean daily weight gain (54.00g). This was closely followed by birds fed diet 4 (53.59g) while birds fed diet 1 had the least (45.79g). The mean daily feed intake was numerically improved as the level of substitution increased from 25% ($T_2$) to 75% ($T_4$) but slightly depressed at $T_5$.

Economics of production are given in Table 4. The cost per kg diet (N) and cost of feed consumed per bird (N) were significantly ($p<0.05$) reduced as the percent substitution of cashewnut meal for soyabean meal increased from 25 to 100% in the diet thus presenting an inverse relationship with the mean cost of production (N) and marginal revenue (N). Though diets 2, 3, 4 and 5 are comparable, diets 3 and 4 seemed to be the most economically advantageous.

## Discussion

The determined nutrient content of the cashewnut meal obtained in this trial was slightly at variance with the findings of Fetuga *et al.* (1975) while the mineral content was closely related to the findings of Atteh (2002). Various factors ranging from the processing method, length of storage and storage facility, the type of soil on which the crop was grown and specie differences could be responsible for such variations. The numerically higher mean daily weight gain observed for birds fed diets 3 could be due to the equal inclusion (50/50) of both the cashewnut meal and the soyabean meal. This could have provided a positive balance of amino acid for the birds (Odunsi, 2002; Faniyi, 2002). The associative dynamic relationship between the dietary nutrients could also have been enhanced.

According to Mcleod (1982), the proportion of dietary energy obtained from fats versus carbohydrates exert an effect on appetite through a physiological 'appetite control center' responsible to the blood levels of certain nutrients such as glucose and amino acids. According to Carew and Hill (1964) and Jensen *et al.* (1970) such an effect might involve an increased ability of the chicks to convert dietary energy from fat into stored energy, thereby permitting a greater increase in dietary intake. Whitehead and Fisher (1975) observe that dietary fat did

Table 2: Percent Composition of Diets Containing Varying Levels of Cashewnut Meal Fed to Broiler Chicks (22-63 days)

| Ingredients | $T_1$ | $T_2$ | $T_3$ | $T_4$ | $T_5$ |
|---|---|---|---|---|---|
| Yellow maize | 58.70 | 58.70 | 58.70 | 58.70 | 58.70 |
| Soyabean meal | 30.00 | 22.50 | 15.00 | 7.50 | - |
| Cashewnut meal | 0.00 | 7.50 | 15.00 | 22.50 | 30.00 |
| Fish meal | 6.60 | 6.60 | 6.60 | 6.60 | 6.60 |
| Bone meal | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Oyster shell | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Salt | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |
| Vitamin Mineral premix | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |
| DL-Methionine | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| Lysine | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| Total | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |
| Calculated analysis: | | | | | |
| Crude protein (%) | 23.24 | 23.00 | 22.77 | 22.54 | 22.31 |
| Metabolizable energy (kcal/kg) | 2931 | 2963 | 2997 | 3030 | 3003 |
| Determined analysis: | | | | | |
| Crude protein (%) | 21.18 | 21.93 | 21.45 | 21.80 | 22.15 |
| Gross energy (kcal/kg) | 3600.00 | 3870.00 | 3850.00 | 3890.00 | 3895.00 |
| Crude fat (%) | 3.62 | 4.01 | 3.87 | 5.11 | 4.68 |
| Ash (%) | 7.62 | 7.74 | 8.14 | 8.06 | 7.85 |
| Dry matter (%) | 90.38 | 89.29 | 91.14 | 90.62 | 91.35 |
| Moisture (%) | 9.62 | 10.71 | 8.86 | 9.38 | 8.65 |

Vitamin - mineral premix provided (per 2.5kg of diet): vitamin A, 15,000,000 IU; Vit. $D_3$, 3,000,000. I.U; Vit E, 30,000 I.U; Vit. K. 2,500. I.U.; Thiamine B, 2000mgr; Riboflavin ($B_2$)mgr; Pyridoxine ($B_6$) 4, 000 mgr; Niacin, 40,000 mgr; Vit. $B_{12}$, 20mgr; Pantothenic acid, 10,000 mgr; Folic acid, 1000mgr; Biotin, 80mgr; Choline chlorides, 500mgr; antioxidant, 125g, manganese, 96gr; Zinc, 60gr; Iron, 24gr; Copper, 6gr.

Table 3: Feed intake, body weight gain and feed efficiency of broiler chicks fed varying levels of cashewnut meal from 22 to 63 days of age

| Performance index | $T_1$ | $T_2$ | $T_3$ | $T_4$ | $T_5$ | SEM |
|---|---|---|---|---|---|---|
| Initial body weight (g) | 321.67 | 320.67 | 321.33 | 319.33 | 320.00 | 1.00 |
| Final body weight (g) | 2200.00 | 2483.30 | 2533.30 | 2516.70 | 2350.00 | 62.44 |
| Total weight gain (g) | 1878.00 | 2162.70 | 2214.00 | 2196.70 | 2030.00 | 62.43 |
| Daily weight gain (9/bird/day) | 45.79 | 52.75 | 54.00 | 53.59 | 49.51 | 1.52 |
| Daily feed intake (g/bird/day) | 115.84 | 118.23 | 120.00 | 120.58 | 118.51 | 1.61 |
| Total feed intake (g, 22-63d) | 4708.3 | 4847.6 | 4919.90 | 4943.7 | 4859.00 | 65.96 |
| Feed-to-gain ratio | $2.53^{a}$ | $2.28^{b}$ | $2.24^{b}$ | $2.25^{b}$ | $2.40^{c}$ | 0.04 |

ab Means is a row, with different superscripts are significantly different ($p < 0.05$).

Table 4: Economics of Cashewnut meal as a substitute for Soyabean meal in broiler diet (22-63d)

| Performance index | $T_1$ | $T_2$ | $T_3$ | $T_4$ | $T_5$ | SEM |
|---|---|---|---|---|---|---|
| Cost/kg feed (N) | $61.95^{a}$ | $58.87^{b}$ | $55.80^{c}$ | $52.72^{d}$ | $49.65^{c}$ | 0.00 |
| Cost of total feed intake/bird (N) | $291.67^{a}$ | $285.40^{b}$ | $274.53^{ab}$ | $260.65^{bc}$ | $241.24^{c}$ | 3.67 |
| Amount realized (N)/bird (N268/kg) | 590.92 | 667.02 | 680.45 | 675.98 | 631.21 | 16.77 |
| Marginal revenue per bird (N) | $299.26^{b}$ | $361.63^{ab}$ | $405.93^{a}$ | $415.35^{a}$ | $389.97^{a}$ | 13.86 |

abc Means in a row with different superscripts are significantly different ($p = 0.05$).

improve efficiency of feed utilization of poultry diets and the improvement was attributed to the high energy concentration of fats, while Homer and Schiable (1980) attributed it to both increased density and improved palatability. Stockstad *et al*. (1983) and Duke and Evanson (1972) suggested that fats may also increase energy utilization of other dietary constituents.

The numerically higher mean daily feed intake observed for birds fed diets 2, 3 and 4 could be due to an improved palatability while high energy density of diet 5 could have slightly depressed appetite. Since, according to Hill and Dansky (1950) and Mark and March (1985), energy rather than protein concentration seems to be the major determinant of feed intake. The values obtained for feed-to-gain ratio for birds fed diets 2, 3 and 4 is an evidence that substituting cashewnut meal for soyabean meal at 25, 50 and 75% seems profitable for productive performance. Nonetheless, according to Ojewola (1993), the relative advantage or disadvantage of using any diet has to be determined by the price of the ingredients at the time of use and the current prices of live and dressed chickens in such environment. From the result obtained, it could be observed that the rapid growth rate exhibited by birds fed 25, 50, 75 and 100% proved to be more economical than those fed soyabean meal, thus justifying the use of cashew nut meal in broiler diets.

In conclusion, the use of cashewunt meal enhanced early maturity of the broiler birds and better monetary returns. Therefore, cashewnut meal could be recommended as a probable substitute for soyabean meal in broiler ration perhaps at 25, 50 and 75%.

## References


Aduku, A.O., 1993. Tropical Feedstuff analysis table Ahmadu Bello University Samaru, Zaria Nigeria, p: 1-4.

Apata, D.F and V. Ojo, 2000. Efficacy of Trichoderma Viride enzyme complex in broiler starters fed cowpea testa-based diets. In Animal Production in New millennium. Challenges and options. Proc. of 25th NSAP Animal Conference, Michael Okpara University of Agriculture, Umudike, p: 132-134.

Atteh, J.O., 2002. Principles and Practice of livestock feed manufacturing Adlek Printers Ilorin Nigeria, p: 13-67.

Atteh, J.O. and F.D. Ologbenla, 1993. Replacement of Fish meal with maggots in broiler diets. Effects on performance and nutrient retention. Nig. J. Anim. Prod., 20: 44-49.

Carew, L. and F.W. Hill, 1964. Effect of corn oil on metabolic efficiency of energy utilization by chicks. J. Nutr. ,83: 293-299.

Duke, G.E. and O.A. Evanson, 1972. Inhibition of gastric motility by duodenal contents in Turkeys. Poult. Sci., 51: 1625-1636.

Faniyi, G.F., 2002. Replacing Groundnut cake with cashewnut waste meal in the diet of pullet chicks Proc. of the 7th annual conference of the animal science association of Nigeria, (ASAN) pp: 106-109.

Fetuga, B.L., G.M. Babatunde and V.A. Oyenuga, 1974. The feeding stuff potential of cashewnut scrap kernel meal. Proc. of tropical products Institute on animal feeds of tropical and subtropical origins. Tropical products Institute, London, (UK) pp: 208-214.

Fetuga, B.L., G.M. Babatunde and V.A. Oyenuga, 1975. The feeding stuff potential of cashewnut scrap kernel meal. Proceedings of the conference on animal feeds of tropical, subtropical origins. Tropical products Institute, London, (UK) pp: 201-207.

Gomez, A.K. and A.A. Gomez, 1985. Statistical procedure for Agricultural Research. Wiley and Sons Inc. New York.

Hill, F.W. and L.M. Dansky, 1950: Studies on the protein requirement of chicks and its relation to dietary energy levels. Poult. Sci., 29: 763.

Homer, A. and J. Schiable, 1980: Poultry Feeds and Nutrition 2nd Edition, pp: 73.

Igwebuike, J.U., I.D. Kwari, C.O. Ubosi and N.K. Alade, 2001. Replacement value of spent sorghum grains for maize in broiler finisher diets. J. Sustain. Agri. Environ., 3: 224-233.

Jensen, L.S., G.W. Shumair and J.D. Latshaw, 1970. "Extra caloric" Effect of dietary fat for developing turkeys as influenced by calorie protein ratio. Poult. Sci., 49: 1697-1704.

Longe, O.G., 1986. Replacement value of biscuit waste for maize in broiler diets. Nig. J. Anim. Prod., 13: 70-78.

Mark, N. and B.E. March, 1985. Food intake and Abdominal adipose tissue in white leghorn hens fed diets of different protein and energy concentrates. Br. Poult. Sci., 29: 311-323.

Mcleod, J. A., 1982. Nutritional Factors influencing carcass fat in broilers. A review. World's Poult. Sci. J., Vol. 38, No.3, pp: 194-200.

Nworgu, F.C, E.A. Adebowale, O.A. Oredein and A. Oni, 1999. Prospects and economics of broiler production using two plant protein sources. Trop. J. Anim. Sci., 2: 159-166.

Odunsi, A.A., 2002. Effect of feeding cashew kernel meal on pre and early laying performance of Pullet. Arch. Zootech, 57:423-429.

Ojewola, G.S., 1993: Productive performance and body composition of broiler as influenced by dietary energy and protein in the Humid tropics. Ph.D thesis Dept of Animal Science. University of Ibadan, Nigeria.

Ojewola, G.S., A.S. Eburuaja, F.C. Okoye, A.S. Lawal and A.H. Akinmutimi, 2003. Effect of inclusion of grasshopper meal on performance, Nutrient utilization and organ of Broiler chicken J. Sustain Agri. Environ., 5: 19-25.

Olunloyo, O.A., 1996: Marketing outlets for cashewnut Proc. of the national workshop on cashew production technology, Cocoa Research Institute of Nigeria. Ibadan.

Sonaiya, E.B, A.R. Williams and S.A. Oni, 1986. A biological and economic appraisal of broiler production up to 16 weeks. J. Anim. Sci. Res., 6:115-125.

Spore, R.G., 1997. More cash returns from cashew. Published by CTA, Wagenigen and the Netherlands. vol. 70, p: 4.

Steel, R.G.D. and J.H. Torrie 1980: Principles and Procedures of Statistics A Biochemical Approach. 2nd Edition. McGraw - Hill Book Inc. New York.

Stockstad, E.L.R., T.M. Jukes and W.L. Williams, 1983. Growth Promoting Effects of Aureomycin on Various Types of Diets. Poult. Sci., 32: 1054-1058.

Ukachukwu, S.N. and F.O.I. Anugwa, 1995. Bioeconomics of Feeding raw or heat treated soyabeans to broilers. Nig. J. Anim. Prod., 22: 137-147.

Whitehead, C.C. and C. Fisher, 1975. The Utilization of various fats by Turkeys of Different Ages. Br. Poult. Sci., 16: 481-485.