Trop. J. Anim. Sci. 2 (2): 61- 66 (1999)
ISSN: 1119-4308

UTILIZATION OF FULL-FAT SUNFLOWER SEED IN THE DIETS OF BROILER CHICKEN

C. A. ADETUNJI AND A. D. OLOGHOBO[1]
Department of Fisheries and ZoologyLagos State University, Lagos, Nigeria.

Target Audience: Nutritionists, farmers, feedmillers.

ABSTRACT

The substitution value of full-fat sunflower seed (FFSF) for groundnut-cake - (GNC) at five substitution levels (0, 25, 50, 75 and 100%) was tested in a feeding trial with 100 (one week - old) Hubbard broiler chicks. The diets were isonitrogenous with 23% and 19% crude protein at the starter and finisher phase respectively. At the starter phase FFSF significantly (P<0.05) increased feed intake, body weight gain and feed to gain ratio at 25% and of protein efficiency ratio and 100%. At the finisher phase significant (P<0.05) higher feed intake and feed to gain ration were observed, with significant (P<0.05) reduction in body weight gain (except at 50% FFSF) and protein efficiency ratio. Carcass characteristics measured showed significant (P<0.05) difference in abdominal fat deposition at the starter phase. Above 50% FFSF inclusion caused significant (P<0.05) decrease in meat weight at the finisher phase. This study suggested that FFSS could substitute 50% of GNC in broiler chicken diets.

Key words: Full fat sunflower seed, broiler chicken, production indices.

DESCRIPTION OF PROBLEM

The recent economic recession in Nigeria has reduced the reliance on importation of feed materials, thus leading to increase awareness in cultivation of some negleted crops such as sunflower seed. This coupled with scarcity of feed ingredients at economic prices and stringent requirement of broiler chicken prompted the evaluation of full-fat sunflower as broiler feed ingredient. Sunflower seed is a potential source of protein and energy and contains no anti-nutritional factor nor any toxic substance (1) which makes it suitable for livestock feed.

Sunflower is of high nutritional value, containing all the known essential amino acids and also rich in minerals and vitamins especially the B-complex vitamins (2). However, information on chemical composition and nutritive value of sunflower seed fed to broiler and other poultry species is practically non-existent in the country. It was reported that in practical type broiler diets,

[1]Department of Animal Science, University of Ibadan, Ibadan, Nigeria

full-fat sunflower could constitute at least 10% of the diet without any adverse effect on performance (3). Present study was conducted to assess the performance and carcass characteristics of broilers fed diet containing different levels of sunflower seed.

MATERIALS AND METHODS

Sunflower seeds obtained from Nigeria Institute of Horticulture Research Station (NIHORT), Ibadan were milled with husks and autoclaved at 105^{0}C, 15lb.sq. inch for 30 minutes. One week old 100 Hubbard broiler chicks previously fed a commercial diet were distributed to five treatments each of which was replicated twice in a randomised complete block design. Ten experimental diets were compounded (Table 1), five for starter phase and five for finisher phase of the experiment. Diet one contained groundnut cake as the plant protein source, while in diets two to five full-fat sunflower seed replaced 25, 50, 75 and 100% of groundnut-cake. Minor adjustments were made in blood meal level to make the diets isonitrogenous. Chicks were fed for four weeks on each of starter and finisher diets *ad. libitum*. The chicks were kept in battery brooders for the first two weeks then transferred to the deep litter.

Performance characteristic data were recorded weekly and analysed seperately for each phase of the trial. The birds were weighed and slaughtered following standard procedures. The various parts were dissected into meat and bone to determine the meat to bone ratio. Data collected were analysed by the method of (4) and significant differences in means were compared by (5).

Table 1: Gross and Chemical composition percentage of Broiler starter and finisher diets

	Starter phase					Finisher phase				
Ingredient	0	25	50	75	100	0	25	50	75	100
Maize	55.95	48.01	39.95	31.82	23.89	63.11	57.30	51.40	45.50	39.70
Groundnut cake	28.06	21.04	14.03	7.00	0.00	20.76	15.50	10.36	5.18	0.00
Full- fat sunflower seed	0.00	14.16	28.32	42.48	56.64	0.00	10.46	20.92	31.38	41.84
Brewers dried grain	5.00	5.00	5.00	5.00	5.00	7.50	7.50	7.50	7.50	7.50
Fish meal	3.00	3.00	3.00	3.00	3.00	0.00	0.00	0.00	0.00	0.00
Blood meal	3.00	3.80	4.70	5.70	6.50	3.00	3.60	4.20	4.80	5.40
Constant Ingredient*	5.00	5.00	5.00	5.00	5.00	5.65	5.65	5.65	5.65	5.65
Determined Chemical Composition										
Crude Protein%	22.23	20.88	19.77	19.77	19.66	16.82	16.25	16.73	16.27	16.07
Crude Fibre%	4.31	4.82	5.32	5.82	6.32	6.22	6.96	6.96	7.33	7.70
Metabolizable energy (Kcal/g)	3.40	3.43	3.42	3.45	3.40	3.88	3.31	3.30	3.03	3.25
Calculated Chemical Composition										
Methionine %	0.38	0.43	0.48	0.54	0.57	0.12	0.16	0.19	0.24	0.28
Lysine %	0.84	0.88	1.01	1.15	1.23	0.56	0.64	0.71	0.77	0.84

* All the starter diets contained 2.50 bonemeal, 1.00 oyster shell 0.30 palm oil, 0.30 salt 0.50 vitamin/mineral premix, 0.20 methionine and 0.20 lysine

While all the finisher diets contained 2.50 bone meal, 1.0 oyster shell, 1.50 palm oil, 0.15 vitamin/mineral premix

RESULTS AND DISCUSSION

The full-fat sunflower seed (FFSF) contained 22.2 % crude protein, 3.9 % crude fibre, 16.2% ether extract, 52.90% nitrogen free extract and 4.2% ash (total) on dry matter basis. Inclusion of FFSF in the diets of broilers chicks (Table 2) caused significant ($P < 0.05$) increased in feed intake, body weight gain and significant ($P<0.05$) progressive improvement in the utilization of feed and protein at the starter phase. The high weight gain, improved utilization of feed and protein of FFSF diets were suggestive of good nutritive value of FFSF based diets. This observation corroborated by the claim of (6) and (7) who reported that the addition of a rich source of energy (maize and oil of FFSF in this experiment) and lysine to sunflower diets led to efficient utilization of diets, similarly (8) reported good nutrient utilization and higher growth which they claimed resulted from the beneficial effect of linoleic acid of sunflower oil. The increase in feed intake may have resulted from the higher crude fibre contents of the FFSF diets because crude fibre tends to lower metabolisable energy. This support the claims of (9) and (10) who reported that fibre imposes limitation on nutrient utilization, particularly energy utilization by broilers. Since birds eat primarily to satisfy their energy requirement and considering that birds on FFSF diets had higher growth, the increased consumption might be necessary to meet their physiological requirement for higher growth rate.

Table 2: Performance characteristics of broiler chicken fed with diets in which full-fat sunflower seed replaced groundnut cake

Parameters	0%	25%	50%	75%	100%	± SEM
Starter phase						
Feed Consumed (kg)	1.33^{c}	1.79^{a}	1.75^{a}	1.64^{b}	1.59^{b}	0.05
Body weight gain (kg)	0.46^{b}	0.58^{a}	0.57^{a}	0.57^{a}	0.60^{a}	0.02
Feed: gain	2.86^{bc}	3.09^{a}	3.06^{ab}	2.89^{bc}	2.96	0.05
Protein efficiency ratio	1.58^{b}	1.52^{b}	1.66^{b}	1.75^{ab}	1.90^{a}	0.05
Finisher phase						
Feed Consumed (kg)	2.48^{d}	3.34^{a}	2.88^{bc}	2.87^{c}	2.99	0.08
Body weight gain (kg)	0.68^{a}	0.56^{b}	0.68^{a}	0.54	0.49^{d}	0.07
Feed gain ratio	3.67^{b}	5.97^{a}	4.25^{b}	5.37	5.67^{a}	0.28
Protein efficiency ratio	1.63^{a}	1.05^{d}	1.41^{b}	1.15	1.02	0.07

*Means with the same alphabet in horizontal rows are not significantly ($P>0.05$) different

At the finisher phase there were significant ($P<0.05$) reduction in protein efficiency ratio, feed conversion ratio and body weight gain (except at 50% FFSF) and significant ($P<0.05$) increase infeed intake. The higher feed intake tained at the finisher phase may have resulted from the crude fibre content of the FFSF diets as explained at the starter phase. However, no progressive increase in intake was observed with increase in FFSF inclusion in the diets. This suggests that the pattern recorded (25% FFSF had highest and 100% FFSF had the lowest) may be guided by other factors apart from the crude fibre content. The increasing oil (and linoleic acid of FFSF oil) and lysine (from increasing levels of blood meal with increasing level of FFSF) were considered. This consideration is based on the recommendations of (6), (7) as well as (11) who advocated the use of a rich source of energy and lysine when sunflower contributed over 50% of the plant protein for efficient utilization of the diets. It should be noted that at the finisher phase synthetic amino acids were not added as recommmended by this authors. This may contributed to the lower performance recorded at the finisher phase when compared to that of the starter phase. The claim of these authors (6,7 and 11) tend to confirm the comparable results obtained with 50% FFSF and 0% FFSF diets, which may have arisen from better synergism among nutrients at this level.

The result obtained with carcass analysis (Table 3) showed significant ($P<0.05$) reduction in fat deposition at the starter phase and lean meat deposition at the finisher phase. From these it is apparent that carcass composition of chickens can be influenced to either favour fat or protein deposition. Possible explanation for observed results is that total energy intake is directly related to the percentage carcass fat only when protein composition is consistent (12).

Table 3: Carcass characteristics of broiler chicken fed with diets in which full-fat sunflower seed replaced groundnut cake

	0%	25%	50%	75%	100%	+ SEM
Starter phase						
Eviscerated weight (as % live weight)	63.45	63.02	62.29	57.75	57.25	0.9
Total bone (as % eviscerated weight)	27.65	27.03	28.01	32.85	32.81	2.88
Total meat (as % eviscerated weight)	72.36	72.97	71.98	67.81	67.82	0.78
Abdominal fat (as % plucked weight)	3.01[a]	2.41[ab]	1.53[bc]	3.27[a]	0.75[c]	0.31
Finisher phase						
Eviscerated weight (% live weight)	71.90	70.89	66.87	69.06	72.86	1.03
Total bone (as % eviscerated weight)	33.58[cd]	31.81[d]	34.60[c]	37.73[b]	40.92[a]	1.03
Total meat (as %eviscerated weight)	66.42[ab]	69.18a	65.98[b]	62.27[c]	59.18[d]	1.03
Abdominal fat (as %plucked weight)	1.75	1.84	1.26	0.86	1.68	0.17

*Mean with the same alphabet in horizontal rows were not significantly ($P>0.05$) different.

That is alteration in protein in quantity and quality would affect efficiency of fat deposition in carcass. High available energy cause imbalance in essential nutrients particularly amino acids, such imbalance could influence fat deposition. (13) reported a decrease in fat deposition with essential amino acid, deficit diet, based on the assumption that energy is required to synthesise protein. Therefore energy required to synthesise protein in a well balanced diet is less than an imbalance diet. It would appear that much energy was expended on protein synthesis, resulting in lower available energy for fat deposition at the starter phase. However, the reduction in total meat and increase in bone at the finisher phase perhaps may be linked to the influence of higher available energy of the FFSF diets in lowering available nutrients. It was not impossible that the bird met their energy requirement without meeting that of essential nutrients particularly protein. This was implicated in causing an imbalance which could have reduced protein synthesis and lean meat production (14). Also the high fibre content of the FFSF diets and rapid passage of digesta resulting in low nutrient absorption could have aggrevated nutrients imbalance.

CONCLUSION AND APPLICATIONS

The findings of this trial reveal that up to 75% of FFSF could be included in broiler chicken diets, but for better feed utilization and carcass quality not more than 50% FFSF should be included.

REFERENCES

1. **Wan, P.J, G. W. Baker, S.P Clark and S.W Matlock,** 1979. Characterisation of sunflower seed and meal. Cereal Chem, 352 -355
2. **Day, H. and E. Levin,** 1954. Nutritioal value of sunflower meal. Poult. Sc. 55:1775-1782
3. **Daghir, N.J, M. A Raz and M Uwayjam,**1980. Studies on the utilization of full-fat sunflower seed in broiler rations. Poult. Sc. 59:2273 - 2278
4. **Steel, R.D. and Torrie, J.H.** 1960. Principles and procedures of statistics McGraw Hill N.Y.
5. **Duncan, D.R.** 1995. Multiple Range and Multiple Test. Biometrics, 11:42
6. **Singh, K.S. and C.M. Prascad,** 1979. Feeding value of sunflower and groundnut cake for broilers. Animal Feed. Sci. Tech. 4:143 - 159
7. **Nowland, P.R.**1980. Use of unextracted sunflower as protein source. Animal Feed . Sc and Tech. 5:51 -57
8. **Alao. S.J and D. Balnave.** 1984. Growth and carcass composition of broilers fed sunflower seed oil and olive oil. Bri. Poult. Sci. 25: 209 -219.
9. **Abdelsamie, A. E., K.M.P Ranaweera and W.E Nano.** 1983. The influence of fibre content and physical texture on the performance of broilers in the tropics. Bri. Poult. Sci. 24 : 383 -390

10. Johnson, G and J. M. McNab 1983. Grassmeal as an ingredient in diets for broiler chickens. Bri. Poult. Sci. 24: 361 - 369.

11. Rad, F. H and K. Keshavarz, 1976. Evaluation of the nutritional value of sunflower meal and possibility of substitution of sunflower for soyabean meal in poultry diets. Poult. Sci. 55: 1757 - 1765

12. Couch, J.R, J.H Trammell, J Cooper, F.M Farr and W.W. Abbot. 1972. Effect of feeding of sub-optimum level of lysine to female chicks on the amino acids contents of selected tissues and organs. Br. Poult. Sci. 13: 425 - 434.

13. Guillaume J., C. Calet, R.F Metais and M. Fendry. 1967. Influence of the quality and quantity of protein in the diet on the utilization of its metabolisable energy by growing chickens in: Energy metabolism of farm animals. pp.pp: 377 - 386. Ed. Blaxter, K.L., J Kielanowski and G. Thorbek, Newcastle - Upon Tyne, Oriel Press.

14. Calet C. 1976. Amino acid requirement of meat producing poultry pp. 305 - 324 in : Protein metabolism and nutrition edited by Cole 1976. Butterworth Boston London.