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REPLACEMENT VALUE OF HIGH FIBRE HULLED SUNFLOWER SEED CAKE FOR SOYBEAN CAKE IN BROILER CHICKEN DIETS

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ABSTRACT

A total of 180 day-old broiler chicken were used to determine the replacement value of high fibre hulled sunflower seed cake protein (HSFSCP) at 0,25,50 and 75 for soybean cake protein (SBCP) .The diets were isocaloric 2.95 and 2.85 kcal/g metabolisable energy and about 23 and 20% crude protein at the starter and finisher phase respectively. At the starter phase , the highest (P<0.05) body weight of 721.75g and protein efficiency ratio (PER) of 1.92 were obtained with 0% HSFSCP which did not differ significantly (P<0.05) from values obtained with 25% HSFSCP while poorest body not and PER values of 599.71g and 1.59% respectively were obtained with 75% HSFSCP diet. Carcass characteristics at this phase showed highest (P<0.05) dressed percentage of 61.12, back of 1.55 and abdominal fat deposit of 1.09 with 0% HSFSCP and lowest values of 53.64, 4.30 and 0.00 respectively with 50% HSFSCP diet. At the finisher phase highest 3563..1353.13g (P<0.05) feed intake was obtained with 0% HSFSCP and lowest value of 3220.50gwith 25% HSFSCP. Best PER value of 1.41 was obtained with 25% HSFSCP while there were no differences among other diets. Highest drumstick value of 4.09 was obtained with 75% HSFSCP and lowest value of 3.83 with birds on 25% HSFSCP. Highest abdominal fat deposit was observed with birds on 0% HSFSCP and lowest value of 0.00 with birds on 75% HSFSCP diets. At the overall (starter and finisher) feed intake, body weight, FCR of birds on 50% HSFSCP did not differ significantly (P>0.05) from values obtained with those on 0% HSFSCP. This study suggested that not more than 50% HSFSCP (22% crude fibres could be replaced with soybean cake protein in the diets of broiler chicken.

Key words. *Broiler, hulled sunflower cake, soybean cake, performance.*

INTRODUCTION

Optimum growth and performance is the primary goal of any livestock producer, consequently attempts are geared at formulating diets which provide dietary constituents at levels that enhance this goal. Overall balance is necessary for efficient use of the resulting diets. However, in practical terms, protein and energy are considered as major component of importance. However, Of a major concern with hulled sunflower seed cake is its high fibre contents which have been implicated in lowering the available nutrients (particularly energy) resulting in imbalance of other nutrients. Earlier studies by *Daghir* et al. (1980), Gous et al. (1990) as well as those of Adeniji and Ogunmodede (2001, 2005) seem to point to the fact that overall balance was yet to be achieved, as sunflower diets were unable to completely produce the desired performance in broiler chicken. They suggested the use of an energy booster to compensate for the low available energy which may likely improve the utilization of its nutrients. The utilization of oil or fat has been reported as an excellent source of dietary energy, as well as its role in increasing energy utilization by poultry (D'mello and Acamovic, 1989; Keren-Zri et al., 1990).

Consequently, this study was designed to establish the replacement value of high fibre (22%) hulled sunflower seed cake protein as substitute for soybean cake protein in the diets of broiler chicken when higher varying oil levels are utilized, as against those used in our previous studies.

MATERIALS AND METHODS

Experimental birds and their diets

One hundred and eighty unsexed day old Anak broiler chicks were used. There were 4 treatments and 3 replicates with 45 birds per treatment and 15 birds per replicate. The birds were kept in tier brooder cages for three weeks where adequate heat was supplied and later moved into deep litter house. Hilled sunflower seed cake (HSFSCP) used was obtained from Tallon Nig. Ltd, Lagos. The four dietary treatments were formulated each for the starter and finisher phases which lasted for a period of five and four weeks respectively. Protein supplied by soybean cake in the control diets was taken to be 100%. In other diets hulled sunflower seed cake protein (HSFSCP) was used to replace 25,50 and 75% of protein supplied by soybean cake protein (on a protein for protein basis). Both experimental diets (Table 1) were made to be isocaloric and protein on rent of about 23 and 20% crude protein at the starter and finisher phase respectively. Feed and water were provided *ad- libitum.*

Parameters measured and statistical analysis

At the beginning of the trial and the subsequently chicks were weighed as individual replicate groups. Weekly feed intake and weight gain were recorded from which feed conversion ratio (FCR) and protein efficiency ratio (PER) were calculated. Carcass analyses were carried out at the 5th and 9th week and 2 birds per replicate were randomly picked, starved using the methods described by Fanimo et al. (1998).

Each bird was cut into parts, the relative weight was calculated by expressing the weight of the cut part as percentage of dressed weight. The cut parts, gizzard and abdominal far values were transformed using square root transformation before they were statistically analyzed. Proximate analyses of test ingredients, feed and droppings were determined by the method of Association of official Analytical chemists (A.O.A.C, 1990). Methabolisable energy value of HSFSCP was as determined by Adeniji (2002), the data obtained were subjected to analysis of variance while significant differences in means were evaluated using Ducan's Multiple Range Test (Gomez and Gomez, 1984).

RESULTS

The nutrient composition of HSFSCP and SBC used is presented in Table II. The results of performance characteristics are shown in table III while table IV showed the results of carcass characteristics at the end of the starter and finisher phases. HSFSCP had higher values of crude fibre, ether extract and nitrogen free extract while SBC had higher metabolizable energy, crude protein and ash content.

At the starter phase inclusion of HSFSCP above 25% resulted in significant ($P<0.05$) reduction in body weight gain and PER. While at the finisher phase PER was significantly ($P<0.05$) improved at 25% HSFSCP inclusion. On the overall experimental period (starter and finisher) inclusion of HSFSCP at 75% significantly ($P<0.05$) reduced body weight, while FCR was significantly ($P<0.05$) increased at 75% HSFSCP inclusion. Also significant ($P<0.05$) reduction in PER was obtained when over 25% HSFSCP was included in broiler diets deposit at 50% HSFSCP inclusion. At the finisher phase 25% and 50% HSFSCP inclusion resulted in significant ($P<0.05$) decrease in drumstick weight and abdominal fat deposit respectively.

DISCUSSION

The better efficiencies of feed utilization observed with HSFSCP diets in this study appeared to be an improvement over earlier studies reported by Adeniji and Ogunmodede (2001-2004) using low fibre (12% HSFSCP) and the high fibre (22% HSFSCP) respectively, who suggested the incorporation of a high energy feedstuff to boost HSFSCP nutrient utilization. Consequently the improved availability of energy could have allowed the birds to meet their energy requirement with less feed (Rad and Keshavarz, 1976; Raj et al., 1978). However, the improvement obtained was not proportional to the level of oil added, which might not be unconnected to the effect of oil on other nutrients, which are known to be affected (Jonsson and McNab 1983, Keren-Zri et al., 1990). It is not unlikely that the birds were able to satisfy their energy requirement without meeting their energy requirement for other essential nutrients, particularly amino acids which are needed for tissue synthesis. Also the possibility of increase in the requirements of other nutrients was also considered, as amino acid requirement is known to increase with increase in productive energy of the diet. Therefore, for improved utilization of feed nutrients, the concept of overall balance particularly between energy and protein component is important. Consequently, the increase productive energy might have influenced the requirements for other nutrients, the inability of the HSFSCP diets to meet these could have led to imbalances which could have reduced the nutrient utilization and subsequent tissue synthesis. Possibilities of high fibre and methionine levels in accentuating the above was considered. Excess methionine (Table 1 Amubode 1982) could have reduced weight gain at higher level of HSFSCP inclusion. These could have contributed along with other factors to the observed weight reduction especially at the starter phase, which might be due to the high requirements of birds for essential nutrients and or inability to cope with low nutrients, since tissue synthesis are generally high at the starter phase. The reduced efficiencies observed could have resulted from the overall nutrient imbalance (imposed by increasing energy) which did not support tissue synthesis, especially as the severity of imbalance increased at higher levels. (Rad and Keshavarz, 1976;

Waldroup et al., 1970). However, the improved efficiency of protein observed at 25% HSFSCP could have resulted from its better amino acid profile.

The low decrease weight observed with HSFSCP diets were determined by the low live weights of the birds (Table III). As earlier explained the influence of higher available energy of the HSFSCP diets was considered in lowering available essential nutrients, which could have reduced protein synthesis and lean meat production by birds on these diets (Kumta et al., 1958; Calet, 1976). The higher gizzard weight of HSFSCP diets at the starter phase may be the effect of the fibre contents on the gizzard, which necessitated increase work load and thus higher weights. With the high oil levels used at this stage one would have expected a less pronounced effect on gizzard. Probably the birds were of able to completely cope with fibre because of their age. The result of abdominal fat weight deposits in this study at both phases can be explained in the following ways' it apparent that it is possible to influence carcass composition of chicken through dietary changes, to either influence fat or protein deposition. Also, total energy intake is directly related to the percentage of carcass fat only when protein composition is consistent (Couch et al., 1972), alteration in protein both in quality and quantity would affect the efficiency of fat deposition. Velu et al. (1972) and Guillaume et al. (1967) reported a decrease in fat deposition with methiomine deficit diets. Thus, the energy needed to synthesis protein in a balance diet is less than in an imbalanced one. It would appear that much energy was expended on protein synthesis resulting in lower energy availability for fat deposition. Another possibility is the nature of oil used. Palm oil was used in this study, consisting mainly saturated fatty acids especially palmitic acid, which are less absorbed in chicken, while Renner and Hill (1962) reported that a slower passage through the intestine would farour greater absorption. Considering the high fibre content and rapid passage of digesta associated with it might not encourage fat absorption. This being aggravated by the nature of fatty acids may contribute to low abdominal fat recorded with broiler fed HSFSCP diets.

CONCLUSION

Based on the observed responses of broiler chicken in this study, it may be suggested that in high energy broiler diet, high fibre sunflower seed cake protein should not exceed 50% of the protein of when combined with soybean cake. The observed carcass quality might be desirable, considering the taste of Nigerians for tough meat, this is based on the effect of fat in meat softening, through its action on juiciness. Broiler produced from such might be more relished further incentive to producer is that sunflower seed cake would undoubtedly reduce demand for other plant protein, thus offering opportunity of widening our choice of feed ingredients, consequently reducing cost of production.

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Table I: Percentage composition of experimental diets

Traits	Starter				Finisher			
	Replacement level of HFSSC (%)				Replacement level of HFSSC (%)			
Ingredients	0	25	50	75	0	25	50	75
Maize	55.00	44.70	33.79	22.00	55.42	47.74	38.47	28.08
Soybean	26.30	19.72	13.15	6.50	21.08	15.81	10.54	5.27
HFSSC	0.00	11.13	22.25	33.88	0.00	8.92	17.84	26.75
Brewers dried grain	6.00	10.25	13.81	17.46	13.00	15.53	18.60	23.60
Oil	2.00	4.50	6.30	9.46	0.70	2.20	4.75	6.50
Constant ingredients*	10.70	10.70	10.70	10.70	9.80	9.80	9.80	9.80
Calculated value								
Metabolisable energy (kcal/kgDM)	2.96	2.95	2.92	2.92	2.85	2.84	2.85	2.84
Crude protein (g/kgDM)	22.84	22.76	22.58	22.49	20.02	19.89	20.03	19.89
Methionine (% of diet)	0.38	0.46	0.55	0.63	0.33	0.40	0.46	0.53
Lysine (% of diet)	1.32	1.29	1.25	1.22	1.07	1.05	1.02	1.00
Determined analysis (dry matter basis)								
Crude protein (g/kgDM)	22.87	22.63	22.56	22.54	20.05	20.08	20.09	20.13
Crude fibre (g/kgDM)	3.54	3.88	6.26	6.59	3.46	5.45	6.98	6.42
Ether-extract (g/kgDM)	3.07	3.48	3.48	4.42	4.43	5.90	9.13	10.76

* Constant ingredient in starter contained 4% fish meal, 3% blood meal, 2.1% bone meal, 1.1% oyster shell 0.25% salt and vitamin mineral premix while finisher dicts contained 2% fish and blood meal, 3.15% bone meal, 2.1% oyster shell, 0.25% salt and vitamin-mineral premix. Each kg of the diet contained 12,500 I.U. vitamin (vit) A, 2850 I.U vit D_3 15 I.U vit. E, 2 mg vit. K., 1.5mg vit. B1, 6mg chlorine chloride, 20mg zinc bacitracin, 90mg lasolocid, 100mg manganese, 50mg iron, 45 mg zinc, 2 mg copper, 1.5 mg iodine, 0.225mg cobalt and I mg selenium.

Table II: Proximate Composition of High Fibre Sunflower Seed cake and Soybeans (kgDM)

	Ingredients	
Parameters	HFSSC	SBC
Dry matter	92.00	91.85
Crude protein	28.00	45.34
Crude fibre	22.00	5.56
Ether extract	11.00	4.07
Nitrogen free extract	26.00	27.74
Ash	5.00	9.14

* The result is the average of three analyses

Table III: Summary of mean values of performance characteristics of experimental birds*

	HSFSCP (g/KgDM)				
Traits	0	25	50	75	±SEM
Feed intake/bird (g)					
Starter	1603.21	1560.28	1605.19	1665.56	20.55
Finisher	3563.13[a]	3220.50[c]	3542.61[ab]	3328.02[bc]	63.60
Starter and Finisher	5166.331	4790.78[b]	5147.80[ab]	4993.58[bc]	74.14
Weekly live weight/bird (g)					
Starter phase	721.75[a]	67.79[ab]	611.74[bc]	599.71[c]	19.71
Finisher phase	941.48	916.02	923.12	874.77	40.65
Starter and Finisher	1663.24[a]	159581[ab]	1534.86[ab]	1472.49[c]	35.29
Feed Conversion Ratio					
Starter Phase	2.22	2.63	2.63	2.79	0.19
Finisher phase	3.79	3.53	3.84	3.80	0.07
Starter and Finisher	311[bc]	3.00[c]	3.35[ab]	3.49[a]	0.007
Protein Efficiency Ratio					
Starter phase	1.96_a	1.92[a]	1.69[b]	1.59[b]	0.05
Finisher phase	1.32[b]	1.41[a]	1.30[b]	130[b]	0.03
Starter and Finisher	1.65[a]	1.67[a]	1.50[b]	1.45[b]	0.03

*Means with the same superscripts in horizontal row are not significantly different (P>0.05)
n.s – not significant (P>0.05), sig. Significant (P<0.05)