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Growth Performance of Pullet Chicks fed graded levels of Sheabutter Cake

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Abstract

The proximate and mineral composition, the saponin content and energy value of sheabutter cake were determined as a preliminary assessment of its potential as poultry feedstuff. This study also examined the effect of the inclusion of sheabuttr cake in the diets of pullets on growth performance for 8 weeks of age. One hundred and twenty-day-old Boven Nera strain of pullet chicks were fed three diets containing 0, 10, and 20% sheabutter cake. Sheabutter cake contained CP, 18.1%; EE, 15.8%; Ash, 4.8%; CF, 10.7% and NFE, 50.6%; Ca, 0.27%; P, 0.2%; Mg, 0.13%; Na, 1.37%; K, 1.43%; Cu, 0.02% and Fe, 1.96%. Saponin, an antinutritional factor was detected in the sheabutter cake and quantified to be 0.014%. The metabolisable energy was calculated to be 19.62 MJ/Kg. The results showed that pullet chicks could tolerate 10% sheabutter cake in their diets up to 8 weeks of age without adverse effect on daily feed intake and daily weight gain. Feed/gain ratio decreased ($P<0.05$) as dietary levels of sheabutter cake increased to 20%.

Keywords: Sheabutter cake, Proximate composition, Growth performance, Pullet Chicks.

Introduction

Sheabutter tree, *Butyrospermum paradoxum* produces shea fruits from which the nut is obtained. Sheabutter cake (SBC) a by-product, is obtained after extraction of the fat from the nut. The sheabutter tree grows wild in the savanna zones of Africa. It is locally abundant in the middle-belt areas (Benue, Kwara and Niger States and Abuja – Federal Capital Territory) of Nigeria where it is found growing wild (Badifu, 1993). Sheabutter cake is a potential tropical feed resource though

information on its utilization is scanty (Adeogun, 1989; Morgan and Trinder, 1980).

Preliminary chemical analysis showed that SBC contains 20% CP; 12% EE; 4.8% Ash; 10.9% CF and 54.5% Carbohydrates (Okai and Bonsi, 1989). Results from literature (Morgan and Trinder, 1980) indicate that a maximum of 25% and 30% level of inclusion in the diet could be tolerated by pigs and ruminants respectively. However, Adeogun, (1989) and Olorede *et. al.* (1996) showed that SBC may be included in broiler rations up to 10%. Meanwhile, there is lack of information on the utilization of this by-product in pullet chicks. Hence, the objectives of the present study were:

i) To determine the proximate composition and anti-nutritional factor (saponin) in SBC.

ii) To examine the effect of feeding graded levels of sheabutter cake on growth performance of pullet chicks.

Materials and Methods

Sheabutter cake was collected in wet form (55.4% dry matter) from a local manufacturer of sheabutter in Offa Local Government Area of Kwara State of Nigeria. The wet cake was sun dried for 3 days, packed in polythene bags and stored in a cold room until analysed (within 4 weeks). Fig. 1 shows the method of processing the nut to obtain the cake by the local manufacturers of sheabutter in Kwara State of Nigeria.

Three isonitrogenous and isocaloric rations were formulated (Table 1). The control ration (diet 1) contained no SBC while test material was incorporated into this basal diet at 10 and 20% to obtain diets 2 and 3. One hundred and twenty day-old pullet chicks of the Bovan-Nera strain were divided into 12 groups of ten chicks each. Four groups were randomly allocated to each dietary treatment as replicates. The pullet chicks were accommodated in floor brooder pens. Routine management and vaccination procedures were followed. The diets, in mash form, and water were provided for the chicks ad libitum. Records of feed consumption and weight gain for each week were kept on a group basis.

The proximate composition and mineral contents of sheabutter cake and the experimental diets were determined (AOAC, 1990) and detergent fibre analysis were carried out according to the methods of Goering and Van Soest, (1970). Gross energy was determined using the adiabatic bomb calorimeter.

The saponins were extracted and isolated by a slight modification of the method of Wall *et. al.* (1952) and used by Lalitha *et. al.* (1987). The concentration of saponins was determined using their haemolytic property as was used by Arzul *et. al.* (1994).

The data were subjected to analysis of variance using SPSS, (1988) and as outlined by Steel and Torrie, (1980).

TABLE 1: Composition (%) of Experimental Diets

	Diets		
Ingredients	1	2	3
Wheat Offal	11.95	10.95	10.65
Maize	59.50	51.50	44.30
Groundnut cake	19.00	17.00	14.00
Sheabutter cake	-	10.00	20.00
Blood meal	3.00	3.00	3.00
Fish meal	3.00	3.00	3.00
Bone meal	2.00	2.00	2.00
Oyster shell	1.00	1.00	1.00
Palm oil	-	1.00	1.00
Common salt	0.30	0.30	0.30
Vitamin-mineral mix[1]	0.25	0.25	0.25
Total	100.00	100.00	100.00
Analyzed Composition (%):			
Moisture	9.80	8.70	8.50
Crude protein	21.89	21.85	22.44
Ether extract	4.09	8.00	10.18
Crude fibre	7.02	8.00	6.59
Total ash	7.84	11.14	9.46.
Nitrogen-free extract	49.36	42.31	42.83
Calculated metabolizable energy (Kcal/kg)	2.89	2.89	2.89

[1]Supplied the following nutrients per kg of diet: Vit. A, 8,000,000 i.u; Vit. D3; 1,500,000 i.u; Vit. E, 3.0g; Vit. K, 3.10g; Vit. B2, 2.50g; Nicotinic acid, 8.00g; calcium-D-pantothenate, 3.00g; Vit. B6, 0.30g; Vit. B12, 8.00mg; Mn, 10.00g; Fe, 5.00g; Zn, 4.50g; Cu, 0.20g; I^2, 0.15; C0, 0.02g; Se, 0.01g.

Results

Table 2 shows the proximate composition, energy value and Saponin content of SBC. Table 3 shows the mineral content of SBC while Table 4 shows the detergent fibre constituent.

Final live weight and average daily gain of the chicks on the 20% SBC supplemented diet was lower ($P<0.05$) than their counterparts reared on treatment containing 0 and 10% SBC (Table 5). Birds fed diet supplemented with 10% SBC had the best feed conversion ratio.

TABLE 2: Proximate Composition, Saponin content and energy value of sheabutter cake on dry matter basis

Moisture (%)	9.06
Crude Protein (%)	18.1
Total ash (%)	4.8
Crude fibre (%)	10.7
Ether extract (%)	15.00
Nitrogen-free extract (%)	50.6
Saponin (mg/g)	0.14
Gross energy (MJ/Kg)	19.2
Metabolizable energy (MJ/kg)	9.62

TABLE 3: Mineral Composition of Sheabutter cake on dry matter basis

Calcium (%)	0.27
Phosphorus (%)	0.2
Magnesium (%)	0.13
Sodium (%)	1.37
Potassium (%)	1.43
Copper (%)	0.02
Iron (%)	1.96

TABLE 4: Fibre fraction of sheabutter cake (g/100g dry matter basis)

Neutral detergent fibre (NDF) (%)	45.2
Acid detergent fibre (ADF) (%)	42.3
Cellulose (cell) (%)	41.8
Hemicellulose (Hemi.) (%)	2.9
Acid detergent lignin (ADL) (%)	0.5
ADF: NDF	0.93
Cell: Hemi	14.41

TABLE 5: Growth performance of pullet chicks fed with graded levels of sheabutter cake from 0 – 56 days of age

Parameters	0% SBC	10% SBC	20% SBC	SEM
Initial body wt. (g)	34.75	34.75	34.00	
Final live weight (g)	433.20^a	401.20^a	324.2^b	1.6
Weight gain (g/chick/day)	7.12^a	6.55^a	5.09^b	1.4
Feed intake (g/chick/day)	33.34^a	29.38^b	27.45^c	9.2
Feed conversion ratio	4.10^a	3.87^b	4.55^a	1.1
Protein efficiency ratio	1.34	1.42	1.22	0.46
Mortality (%)	0	0	2.5	

a, b, c = Means without common superscripts (a, b, c) on the same row are significantly different ($P < 0.05$)

TABLE 6: Input – Output analysis and economic efficiency of dietary treatments.

	Diets		
Economic Parameters	1	2	3
Day old chick (₦)	60.00	60.00	60.00
Feed intake (Kg)	1.86	1.64	1.53
Price/Kg feed (₦)	19.40	18.60	17.70
Feed Cost (₦)	36.22	30.60	27.21
Vet. And Miscellaneous (₦)	20.00	20.00	20.00
Total cost/chicken (₦)	116.22	110.60	107.21
Average body weight (Kg)	0.43	0.401	0,32
Actual body weight gain (Kg)	0.39	0.36	0.28
Feed cost/body weight gain(₦)	91.00	83.60	94.15
Feed cost/Kg (₦)	228.64	228.41	325.77
Total revenue (₦)	173.20	160.40	129.60
Net revenue (₦)[1]	56.98	49.80	22.39
Economic efficiency[2]	0.49	0.45	0.20

1 = Assuming that the cost of Kg live weight of pullet chick is N 400.00.

2 = Net revenue per unit cost i.e. $\frac{\text{Net revenue (NR)}}{\text{Total cost (TC) per chicken}}$

Discussion

Nutrient composition of SBC was fair, it showed that it is a medium protein source and has high fat and fibre content. The SBC proximate composition is similar to that of palm kernel meal and coconut oil meal but poorer than those of soyabean meal and

groundnut cake which e the traditional sources of plant protein in poultry feeds (Oyenuga, 1968). The total amount of saponins in SBC (0.14mg/g) was much lower than that found in soya bean meal and some pulses (Jood *et. al.* 1986. Hence, SBC may be a good ingredient for use in the tropics where energy requirements may be low. It can also partially replace those costly plant protein ingredients like groundnut cake or soya bean meal. This was supported by the work of Longe and Ogedegbe, (1989) that in environment where high temperature is accompanied by high humidity, bulky diets may have a useful role as a food for poultry provided the utilization of nutrient is not impaired and sufficient dietary energy is metabolised to meet their needs.

Feeding of SBC containing diets had a significant ($p<0.05$) effect. The poor growth rate is attributable to the lower feed intake which could be due to the poor palatability of the ingredient (Adeogun, 1989) and (Olorede, *et. al.* 1996). The poor palatability of SBC and its effect on growth performance of broilers has been clearly established by previous workers (Adeogun, 1989) and (Olorede *et. al.* 1996). Therefore, the trend of the growth rate of chicks fed SBC parallel previous observations (Peterson, 1950; Heywang and Bird 1954; Morgan and Trinder, 1980 and Olorede *et. al.* 1996).

The cost analysis (Table 6) showed that the cost of diets decreased as SBC increased due to the cheaper cost of SBC at the expense of maize and groundnut cake which are major feed ingredients. However, because of the very poor growth performance of birds fed the 20% SBC – containing diet, optional level of SBC to be used in diets containing maize and groundnut cake as major energy and protein sources may be 10%.

Mortality was low in all the treatments (Table 5) suggesting that saponin content of SBC and intake of this antinutritional factor even at highest inclusion level of 20% did not reach the threshold level of toxicity. This is in agreement with the work of Cheeke, (1971) and Peterson (1950) who reported that 20% alfalfa equivalent to 0.3% saponin in the diet of chicks was not toxic.

Based on the results of the study, it can be concluded that SBC is nutritionally adequate and feeding it to a level of 10% in the diet of pullet chicks support growth and had no adverse effect on the performance of the chicks.

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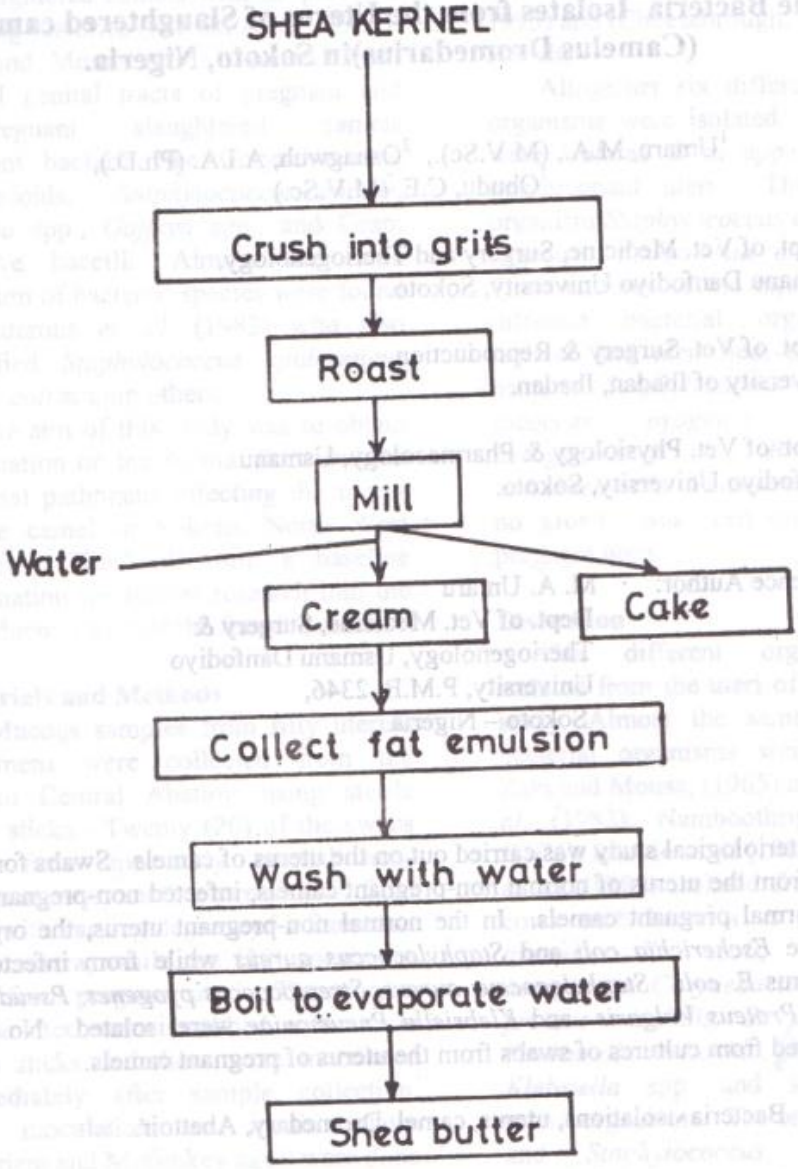

Fig. 1 The extraction process of shea butter in Kwara State of Nigeria.