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THE REPLACEMENT VALUE OF SORREL SEED MEAL FOR GROUNDNUT CAKE IN COCKERELS DIET

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ABSTRACT
The effect of replacing groundnut cake (GNC) with boiled sorrel seed meal (BSSM) at 0,15,30,45 and 60% in the diet of 200 seven day old chick of Isa brown x Goldline cockerel on growth performance, carcass characteristic and cost analysis was assessed for 98days. At 60%, BSSM supported higher (P<0.05) feed intake, body weight gain and live weight. FCR was also better (P<0.05) in the groups fed BSSM. Feed cost and feed cost/Kg gain were reduced (P<0.05) by incorporating BSSM in the diet. Carcass weight and weight of cut-up parts were heavier (P<0.05) in the groups fed BSSM. It was concluded that up to 60% of GNC can be replaced by BSSM in the diet of cockerels for improved performance.

KEY WORDS: Cockerels, Boiled Sorrel Seed Meal, Growth, Carcass

INTRODUCTION

The development of the poultry industry in Nigeria is still suffering from the escalated cost of feed. Feed cost accounts for about 60 to 70% of the total cost of poultry production in Nigeria (Nworgu *et al.*, 1999). The high cost of feed is largely due to the exorbitant price and scarcity of conventional feed ingredients, (Apata and Ojo, 2000). The price of groundnut cake (GNC) has more than doubled over the past few years as a result of the low groundnut production coupled with the high demand for the cake for human and animal consumption. Thus, depending on groundnut cake and soybean meal as the sole source of protein in poultry diet is gradually becoming economically impracticable in Nigeria. Research into new sources of plant protein for poultry should therefore be intensified.

Hibiscus sabdariffa is a popular plant (belonging to the family *Malvceae)* and is presently cultivated widely in the old and the new world tropics and subtropics. The presumed origin is South East Asia in the region of India to Malaysia. It has long been cultivated in Africa. Probably, it was carried by slaves to the new world (Duke, 1999). *Hibiscus sabdariffa* is a well-adapted crop in the semi-arid zone of West Africa including Nigeria and it is generally planted as a border crop. The leaves are used as vegetable and the floral parts in the preparation of "Sobo", a local drink. The stem provides fibre and the seeds are eaten by scavenging poultry (Philips, 1977). The seed of *Hibiscuss sabdariffa* is said to have high protein value and it is on account of its protein content that it is well priced for human consumption in French West Africa (Mali, Guinea, Burkina Faso, Cote d' Ivoire). However, in Nigeria larger quantities of the seeds of this crop are wasted on the farm annually and just enough being collected and stored for planting. There are several reports on the nutritional and functional properties of *Hibiscus sabdariffa* (Philip,1997; Al- Wandawi, 1998; Ahmed and Hudson, 1999; Kwari *et al.,* 2008). This study was therefore designed to determine the effect of replacing groundnut cake meal with boiled sorrel seed meal on the performance of cockerels.

MATERIALS AND METHODS

Experimental Stock and Management

Two hundred (200) 7 days-old Isa brown x Goldline cockerel chicks were used for the study. The cockerel chicks were individually weighed and randomly selected and allocated to each of the five replacement levels of groundnut cake replaced by sorrel seed meal in a completely randomized design. Each treatment consisted of forty birds and was replicated four times with 10 birds per replicate. Feed and clean drinking water were provided *ad libitum* throughout the 14 weeks experimental period.

Experimental Diets

The sorrel seeds were purchased from markets around Maiduguri metropolis. The seeds were cleaned and then boiled at 100^{o}C for 30 minutes. It was then sundried for 72hours, milled and incorporated into the diets at the appropriate levels.

Five (5) experimental diets (chick and grower mashes) were formulated (Tables 1 and 2). Diet 1 (control) was based on groundnut cake (GNC) as the major protein source, while diets 2, 3, 4 and 5 had part of GNC replaced with the boiled sorrel seed meal (BSSM) at 15%, 30%, 45% and 60% respectively.

Data Collection

Feed intake, weight gain, feed conversion ratio, carcass characteristic and cost analysis formed the response criteria. Feed intake was determined by subtracting the leftover every morning from the quantity fed the previous day. Birds were weighed at the beginning of the experiment and weekly thereafter and weight gain were calculated by difference between two consecutive weeks. Feed conversion ratio was calculated by dividing the quantity of feed consumed by the weight gain. At the end of the experiment, 4 cocks were selected from each

treatment for carcass measurements. The birds were starved of feed overnight before they were slaughtered the next morning. The slaughter weights, dressed weight, weight of some cut- up parts were recorded for each bird.

Data were analyzed as a completely randomized design using the General Linear Model (GLM) procedure of the Statistical Analysis Software package (SAS Institute, 2002), means were compared using the least significant difference (LSD).

TABLE 1: Composition of chick mash containing varying levels of boiled sorrel seed meal

Ingredients (%) Replacement levels of groundnut cake by boiled sorrel seed meal

Ingredients	(Control 0%)	15%	30%	45%	60%
Maize	57.47	56.97	55.97	54.97	53.97
Groundnut cake	20.28	17.24	14.20	11.15	8.11
Sorrel seed meal	0.00	3.04	6.08	9.13	12.17
Wheat offals	13.00	13.00	13.00	13.00	13.00
Fish meal	5.50	6.00	7.00	8.00	9.00
Bone meal	3.00	3.00	3.00	3.00	3.00
Methionine	0.10	0.10	0.10	0.10	0.10
Lysine	0.10	0.10	0.10	0.10	0.10
Salt	0.30	0.30	0.30	0.30	0.30
Premix *	0.25	0.25	0.25	0.25	0.25
TOTAL	100	100	100	100	100
Calculated analysis					
Crude protein (%)	19.93	19.91	19.88	19.67	19.56
ME (kcal/kg)	2807.24	2802.70	2795.70	2788.10	2780.0
Crude fibre (%)	3.84	4.14	4.45	4.75	5.06
Calcium (%)	1.08	1.01	1.06	1.12	1.17
Phosphorus (%)	1.01	1.07	1.15	1.13	1.14
Lysine (%)	0.87	0.99	1.15	1.29	1.44
Methionine (%)	0.32	0.36	0.41	0.45	0.49

* Bio-mix chicks supplied /kg Vit. A = 4,000,000.00 IU, Vit. D_3 = 800,000.00 IU Vit. E = 9,200.00mg, Niacin = 11,000.00mg Vit B_1= 720.00mg, B_2 = 2,000.00mg B_6 = 1,200.00mg, 1200.00mg B_{12} = 600mg; K_3 = 800.00mg, Pantothenic acid = 3,000.00mg; Biotin = 2,400.00mg, Folic acid = 300.00mg; Iodine 400.00mg; Iron = 8,000.00mg, manganese = 16, 000.00mg; selenium = 80.00mg; zinc = 12,000.00mg; Anti oxidant = 500.00mg.

TABLE 2: Composition of growers mash diet containing varying levels of boiled sorrel seed meal

Ingredients (%) Replacement levels of groundnut cake by boiled sorrel seed meal

	(Control 0%)	15%	30%	45%	60%
Maize	67.37	66.87	66.37	65.87	65.37
Groundnut cake	9.88	8.40	6.92	5.43	3.95
Sorrel seed meal	0.00	1.48	2.96	4.45	5.93
Wheat offals	16.00	16.00	16.00	16.00	16.00
Fish meal	3.00	3.50	4.00	4.50	5.00
Bone meal	3.00	3.00	3.00	3.00	3.00
Methionine	0.1	0.1	0.1	0.1	0.1
Lysine	0.10	0.10	0.10	0.10	0.10
Salt	0.30	0.30	0.30	0.30	0.30
Premix *	0.25	0.25	0.25	0.25	0.25
Total	100	100	100	100	100
Calculated analysis					
Crude protein (%)	15.00	14.90	14.90	14.93	14.80
ME (kcal/kg)	2849.52	2845.90	2845.90	2838.64	2835.01
Crude fibre (%)	3.85	3.99	4.15	4.29	4.44
Calcium (%)	1.30	1.37	1.50	1.48	1.46
Phosphorus (%)	1.03	1.04	1.11	1.12	1.13
Lysine (%)	0.61	0.67	0.75	0.82	0.89
Methionine (%)	0.25	0.28	0.3	0.32	0.35

* Bio-mix Grower supplied /kg, Vit. A =4,000,000.00 IU, Vit. D_3 = 800,000.00 IU, Vit. E = 10,000.00mg, K_1 = 200.00mg, B_2 = 1000.00mg; Pantothenic acid = 3,500.00mg, Biotin = 1,500.00mg, Folic Acid = 200,000mg, Choline Chloride = 120,000.00mg, cobalt = 80.00mg; copper = 800.00mg, lodine = 100.00mg, Iron = 15,000.00mg; Manganese = 60,000.00mg Selenium = 400.00mg; Zinc =15,000.00mg, Anti oxidant = 400.00mg.

RESULTS AND DISCUSSION

The productive performance of cockerels fed on varying levels of sorrel seed meal as a replacement for groundnut cake (GNC) is presented in Table 3.

The daily feed intake showed significant (P<0.05) differences among the treatment means. Birds fed on 60% replacement levels consumed the highest feed compared to the birds fed on other replacement levels and the least consumption was by birds fed the (control) diet. This observation agrees with that of kwari et al. (2011) who reported higher feed consumption in broilers that were offered boiled sorrel seed meal in their diet compared to the control. There were significant (P<0.05) differences among means in the daily weight gain and final weights of the birds. The body weights and weight gains increased with increasing level of boiled sorrel seed meal in the diets. The mean final weights (1065.0g – 1177.50g) were lower than the average of 1700g reported for cockerels of same age. The difference may be attributed to the harsh environmental conditions under which our birds were produced. High ambient temperature has been associated with lower body weight in poultry (Yahav, 2009). The values obtained for daily weight gain (12.07g – 15.41g) were similar to the range (13.86g – 14.92g) reported for cockerels fed differently processed sorrel seed meal by Kwari et al. (2010).

TABLE 3: Productive performance of cockerels fed on diets containing varying level for sorrel seed meal as a replacement groundnut cake

Parameters	Replacement levels of groundnut cake by sorrel seed meal.					
	Control	15%	30%	45%	60%	SEM±
Initial weight g/bird	76.25	77.50	76.45	75.50	76.00	1.441^{NS}
Final weight g/bird	1065.00^{d}	1100.00^{c}	1126.30^{b}	1173.80^{a}	1177.50^{a}	3.411*
Daily weight gain g/bird	12.07^{e}	13.01^{d}	14.04^{bc}	14.04^{b}	15.41^{a}	0.023*
Daily feed intake g/bird	49.00^{c}	49.02^{c}	52.07^{b}	52.38^{b}	54.78^{a}	0.679*
Feed conversion ratio	4.06^{a}	3.81^{b}	3.70^{c}	3.66^{c}	3.58^{d}	0.018*
Feed cost ₦/kg	27.11^{a}	25.08^{b}	23.08^{c}	21.07^{c}	19.08^{d}	0.260*
Feed cost ₦ /kg gain	109.88^{a}	02.04^{b}	100.43^{b}	97.31^{c}	96.26^{c}	0.606*
Mortality percentage	5	2.5	2.5	5	5	NA

$^{a, b, c}$…. Means within the same row bearing different superscripts differ significantly (P<0.05)
SEM – Standard Error of Means
NA – Not Analyzed
NS – Not significant (P>0.05)
* Significant difference (P<0.05)

TABLE 4: Carcass characteristic of cockerel fed on diets containing varying levels of sorrel seed meal as a replacement for groundnut cake

Parameters (g)	Replacement levels of groundnut cake by sorrel seed meal.					
	Control	15%	30%	45%	60%	SEM±
Carcass weight	790.50^{c}	817.10^{c}	855.00^{b}	876.75^{a}	878.25^{a}	8.900*
Drumstick	52.80^{d}	53.273^{cd}	65.92^{b}	72.915^{a}	78.870^{a}	5.243*
Thighs	117.31^{d}	135.08^{bc}	140.47^{bc}	150.64^{ab}	163.44^{a}	4.180*
Wings	61.09^{c}	82.24^{a}	76.58^{b}	81.82^{a}	82.70^{a}	3.749*
Breast muscle	76.08^{b}	82.24^{a}	85.38^{a}	82.64^{a}	86.65^{a}	2.090*

$^{a, b, c,\ldots}$ Means within the same row bearing different superscripts differ significantly (P<0.05)
SEM – Standard Error of Means
NS – Not significant (P>0.05)
* Significant difference (P<0.05)

Feed conversion ratio were also better (P<0.05) with increased level of boiled sorrel seed meal in the diets. Thus birds on diets in which 60% of the groundnut cake was replaced by boiled sorrel seed meal had the best feed efficiency.

The feed cost (₦/kg) and feed cost per kg gain also showed significant (P<0.05) difference. These results suggest that incorporation of sorrel seed meal in the diet of cockerels generally reduced feed cost (₦/kg) and gave better returns in terms of feed cost per kg gain. This observation agreed with the report of Smith *et al.* (1981) that the use of plant protein sources in chicken diets reduced feed cost drastically and gave better returns in terms of total feed cost and cost per kg gain. The results of the carcass characteristics (Table 4) all showed significant (P<0.05) difference among the treatment means. The carcass weights for birds fed on 45% and 60% replacement levels were significantly (P<0.05) higher followed by birds fed on 15% and 30% and the least was the 0% (control) diet. The weights of the cut-up parts also followed similar pattern like the carcass weight of birds. The values obtained in this study compared well to values

reported by Awesu *et al.* (2000), Salami *et al.* (2004) and Butterworth *et al.* (2001) for cockerels. Overall, birds fed sorrel seed meal had better ($P< 0.05$) cut-up parts than those fed groundnut cake as the major protein source in the diet.

There was no particular trend in mortality values. Post mortem results showed that the birds died of heat prostration. The death was due to prolonged period of high ambient temperature ($30.36^{O}C – 43.58^{O}C$) at the time of the experiment.

CONCLUSION

It was concluded that boiled sorrel seed meal can replace up-to 60% of groundnut cake in the diet of cockerels.

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