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Full Length Research Paper

Response of cockerels to diets containing different levels of sheanut cake

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Abstract

A-four week on-farm-feeding trial was conducted to evaluate the response of 120 'Ross 308' cockerel chicks to diets containing sheanut cake (SNC). Three isonitrogenous and isocaloric diets represented as SNC 0%, SNC 5%, and SNC 10% were fed in a completely randomized design (CRD). Measured parameters were body weight, weight gains, and feed intake. Also, feed conversion efficiency and feed cost per kilogram diet were calculated. Hematological parameters were also obtained after the 28-day trial. A reduction in performance was observed with inclusion of SNC into the diets. Weight gain, feed conversion efficiency (FCE) and final body weight reduced significantly (P>0.05) with addition of SNC. However, feed cost per kilogram weight reduced with inclusion of SNC. The highest feed consumption was recorded among birds offered diets containing 10% SNC. The health of the birds was not affected by dietary treatments. It was therefore concluded that though performance of birds was significantly hampered in this experiment, SNC could still serve as a potential replacement for cotton seed cake in cockerels' diet during periods of scarcity.

Keywords: Cockerel, performance, blood parameters and sheanut cake.

INTRODUCTION

A major problem facing the poultry industry currently is the high costs of poultry feeds resulting from the soaring costs of conventional feed ingredients (Mmereole, 2008). Feed cost for non-ruminant animals such as pigs and poultry accounts for between 70 and 80% of the total recurrent cost of production (Osuwari *et al*., 1995). In Ghana and some other low-income, food deficit countries (LIFDC) most poultry farms have shut down due to high costs of poultry feeds (Ekenyem, 2007), thereby escalating the animal protein deficiency crisis already existing.

Alternative feed resources which are cheap, abundant and not in competition with other large scale demands, must be sourced for. In the past decades, studies have been carried out to identify alternative and non-conventional feed resources which are cheap and easily available for poultry production (Aduku, 1993; Esonu et al., 2003). Consistent increase in prices of some available feed ingredients that are protein and energy sources has stimulated huge research interests into numerous underutilized feed resources. Agro-industrial by-products such as SNC could be used to spare these conventional feed ingredients in poultry diets because of their low price and availability.

Sheanut cake is a by-product obtained during the processing of shea (*Butyrospermum parkii*) nuts to produce sheanut butter. The SNC which is made available after extraction is a material that has attracted the attention of scientists and animal nutritionists. Atuahene *et al*. (1997) investigated SNC for its nutritional quality. Chemical analyses of the cake indicated its overall nutritional value to be high. The crude protein, fat, fibre, ash, nitrogen free extract and metabolizable energy contents were 162.4 g kg^{-1} DM, 134.0 g kg^{-1} DM, 95.0 g kg^{-1} DM, 42.0 g kg^{-1} DM, and 7.12 MJ kg^{-1} DM, respectively.

This experiment was therefore conducted with the objective to find out the usefulness of SNC in cockerels' diet.

Table 1. Percentage Composition and Analysis of Experimental Diets.

Ingredients	0% SNC	5% SNC	10% SNC
Maize	55	55	55
Cotton seed meal	15	10	0
Copra cake	13.5	13.5	13.5
Sheanut cake	0	5	10
Fishmeal	4	4	4
Wheat bran	10	10	10
Oyster shell	1.5	1.5	1.5
Vitamin/mineral premix	0.5	0.5	0.5
Salt	0.5	0.5	0.5
Calculated Composition (% DM)	18.10	17.20	18.21
Crude protein	4.90	5.05	6.69
Crude fiber	4.55	4.00	4.44
Ash	5.18	4.02	6.20
Ether Extract	3.10	3.21	3.23
Calcium	0.32	0.29	0.30
Available phosphorus	0.69	0.60	0.63
Lysine	0.27	0.24	0.26
Methionine	2119	2111	2108
ME (Kcal/kg)			
Proximate Composition (% DM), except ME			
Crude protein	17.31	17.90	16.99
Crude fibre	7.74	6.56	5.35
Ash	3.50	5.00	5.09
Ether extract	2.50	2.00	1.00
Moisture	14.00	13.50	13.00
Nitrogen Free extract (NFE)	54.96	55.04	58.76

*Composition of vitamin/mineral premix per kg: Vitamin E, 25mg; Vitamin A, 6250 IU; Vitamin D3, 1250 IU; Vitamin K3, 25mg; Vitamin B1, 25mg; Vitamin B2, 60mg; Vitamin B6, 40mg; Vitamin B12, 2mg; Elemental calcium, 25mg; Elemental phosphorus, 9mg; Elemental magnesium, 300mg; Iron, 400mg; Selenium 1.0mg, Iodine 20mg, Copper 60mg, Magnesium 100mg, cobalt 10mg, Zink, 150mg; Sodium Chloride, 1.5mg; Choline Chloride, 500mg; Live Lactobaccillus spore, 0.2 million cfu; Niacin, 40mg; Folic Acid, 10mg; d-Biotin, 5mcg.

Materials and Methods

The experiment was conducted at K.D. Yeboah Farms in Ashanti Mampong, Ghana. One hundred and eighty 4-week old cockerels (Ross 308) were used in this study. The recommended medications and vaccines were administered to ensure good health of the experimental birds. At four weeks of age, the birds were weighed and divided into three groups in a completely randomized design. There were three replicates of fifteen birds in each group making a total of 45 birds per treatment. The feed was formulated with SNC to replace cotton seed cake in the diets at 0, 5, and 10% (Table 1). Feed and water were supplied *ad libitum* throughout the experimental period. Birds were weighed weekly. Growth rate, feed conversion ratio and mortality were monitored. The cost benefit of feeding SNC was calculated at the end of the study. Blood samples were obtained from two birds from each replicate at the end of the experiment. A new sterile syringe was inserted into the wing vein of each selected bird and 2 ml of the blood extracted which was placed inside sterile test tubes containing Ethylene Diamine Tetra Acetic Acid (EDTA).

Then the blood samples were analyzed for packed cell volume (PCV), hemoglobin (Hb), white blood cell (WBC), red blood cell (RBC), mean corpuscular volume (MCV) and mean corpuscular hemoglobin concentration (MCHC), mean corpuscular hemoglobin (MCH) and lymphocytes (LYM). Data collected were subjected to analysis of variance and the significant differences between treatment means were determined at 5% confidence level (SAS, 1999). Differences between means were determined by the use of the Duncan's Multiple Range Test (Steel *et al*., 1997).

Table 2. Effect of Experimental Diets on performance of Birds

Variable	0% SNC	5% SNC	10%SNC	SEM
Mean Initial Body Weight (g/bird)	117.5	117.2	118.7	1.18
Mean Final Body Weight (g/bird)	281.4[a]	251.8[b]	257.5[b]	6.05*
Mean Total Weight Gain (g/bird)	163.9[a]	133.8[b]	139.5[b]	6.22*
Mean Feed Intake (g/bird/day)	30.9[a]	36.8[b]	39.6[b]	2.03*
FCE (Feed/Gain)	0.2[a]	0.3[b]	0.2[a]	0.01*
Mortality (%)	0.3	0.3	0.00	0.38

[ab]: Treatment means with different superscripts within the same row are significantly different at P<0.05
*Significant difference at P<0.05
SEM – Standard Error Mean

Table 3. Effect of Experimental Diets on Blood Variables

Parameters	0% SNC	5%SNC	10% SNC	SEM
WBC ($x10^3/\mu L$)	9.1	10.0	9.0	0.9
RBC ($x10^6/\mu L$)	1.8	2.4	1.7	0.21
HGB (g/dL)	9.4	11.3	8.7	0.42
HCT (%)	19.8	25.6	19.4	3.2
MCV (fL)	109.6	110.9	115.5	3.8
MCH (pg)	52.8	44,7	52.2	2.8
MCHC (g/dL)	48.6	40.6	45.2	3.7
LYM (%)	97.6	94.6	98.4	0.4

[ab]: Treatment means with different superscripts within the same row are significantly different at P<0.05
SEM – Standard Error Mean

Table 4. Costs and Benefits of Feeding with Different Diets.

Parameters	SNC 0%	SNC 5%	SNC 10%
Feed cost/kg (GH₵)	0.9	0.7	0.8
Feed intake (g/bird/day)	30.9	36.8	39.6
No of days on feed	28	28	28
Total cost of feed over the period/bird (GH₵)	0.7	0.7	0.8
Price of bird at 8 weeks (GH₵)	1.0	1.0	1.0
Net revenue/bird (GH₵)	0.3	0.3	0.2

NOTE: US$ 1.0 = GH₵ 1.5

Results and Discussion

Treatment effects on growth, hematology and economics of production are presented in Tables 2, 3 and 4.

Final weight and weight gain declined significantly ($p<0.05$) with inclusion of SNC. Olorede *et al*. (1997) also reported poor growth rate of broilers fed 15% SNC based diet in a similar experiment. Efficiency of feed utilization decreased with addition of SNC to diets at 5%. Regarding daily feed intake (DFI), it was clear that compared to the control, SNC inclusion at 5 or 10% significantly increased DFI. The poor growth performance of birds fed sheanut meal diets was not surprising as similar observation has been made in previous studies (Olorede *et al*., 1997). This could be attributed to the relatively high concentrations of tannins in sheanut (Okai et al., 1995). For instance, broilers fed diet containing the sheanut meal fermented with *A. niger* had an improved growth performance that was 82% of the control birds and feed efficiency in the mentioned study was 86% of the control. The depression in growth performance of birds fed the unfermented sheanut meal was attributed to the effects of residual tannins which make digestion of protein difficult (Annongu et al., 1996; Smulikowska et al., 2001). Tannins combine with proteins, including enzymes in the gastro intestinal tract and thereby negatively inhibit the digestibility of proteins (Jansman et al 1995), thus reducing the chick's growth rate and the efficiency of feed

utilization. Iji et al., (2004) also in a similar experiment discovered that high dietary tannins resulted in reduced weight gains and poor feed efficiencies in birds. The experimental treatments did not have any significant effect on health of the birds (P>0.05). In this experiment, all the blood parameters fell within the normal range reported by Pampori (2003). This observation suggests that the health of the birds were not compromised. The cause for the mortalities recorded in this study according to postmortem examination was not clear, since all the organs of the birds were normal.

The feed cost per/kg decreased with inclusion level of 5% SNC as shown in Table 4. Birds fed 10% SNC diets recorded the highest feed cost as a result of the high intake of this diet. There was 1.4% reduction in feed cost with 5% inclusion of SNC during the experimental period. Feed cost however increased by 10.8% with 10% inclusion of SNC.

CONCLUSION

Sheanut cake is potentially valuable protein supplement that can be included in diets for cockerels, replacing 10% of cotton seed cake. At this level of inclusion acceptability of the diet containing SNC was not affected. However, weight gain was significantly affected. Nevertheless, during periods of scarcity of cotton seed cake, SNC could serve as a potential substitution for cockerels.

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